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GETTING STARTED
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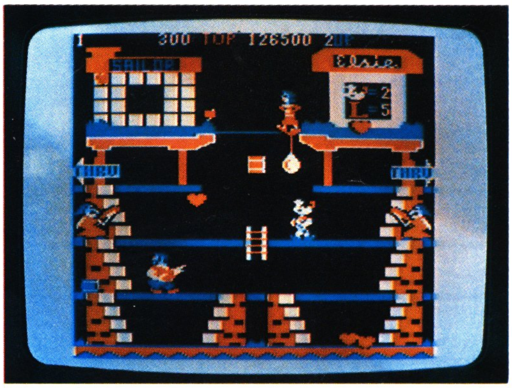
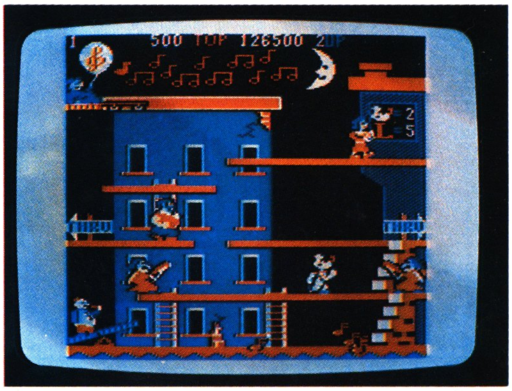


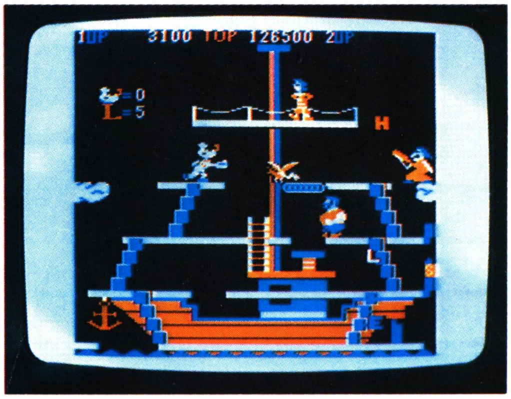
The first screen objective is to catch enough of Elsie's kisses (those Red Heart Shaped Things) to fill in the squares on the Sailorman's house. If you can time your punch just so, you can send the punching bag over to knock the bucket down and, with a little bit of luck, right onto **Bigfatbadguy's** head. This will give you a little (but not much) time to catch all those RHSTs.

You must avoid contact with **Bigfatbadguy** who is actively pursuing you. You must also be careful of **Olduglyseawoman** who will appear at higher difficulty levels to chuck empties at you. Either avoid the flying bottles or punch them (with the fire button) to keep from being knocked into the water.



The second screen objective is to collect enough notes to play Elsie a little love song. You may jump off and onto the other end of **Fatguyeatingahamburger's** teetertotter to fly up a deck and even two decks if you manage to catch hold of **Smartaleckkid's** grab handles. Time it right and away you go.

The Third screen objective is to collect enough letters (thrown by Elsie's cries for H-E-L-P) to complete a ladder all the way to the crow's nest where Elsie is calling you. Beware of the Crow, however, who thinks you are after her eggs!



On all screens, eating a can of **collard greens** (labeled "S" for Collard and grasped by punching the can just right) will give you amazing speed, strength and agility and allow you to send **Bigfatbadguy** into the drink with a single punch.

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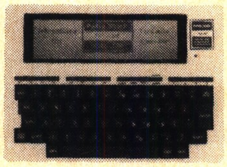

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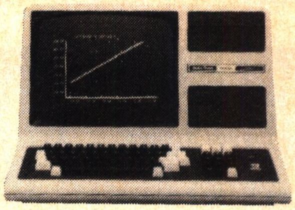

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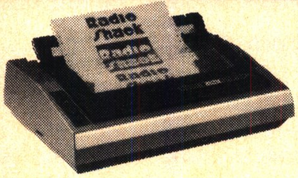

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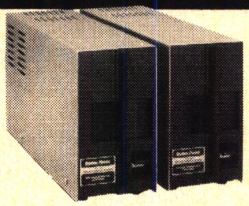

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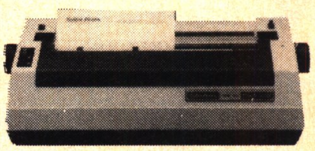

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Under The RAINBOW

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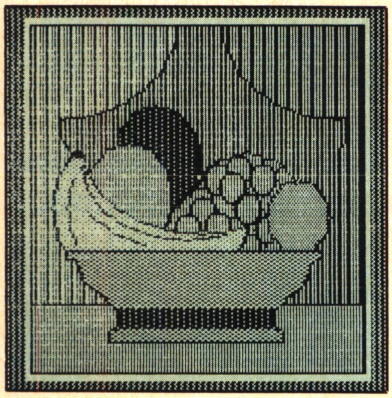
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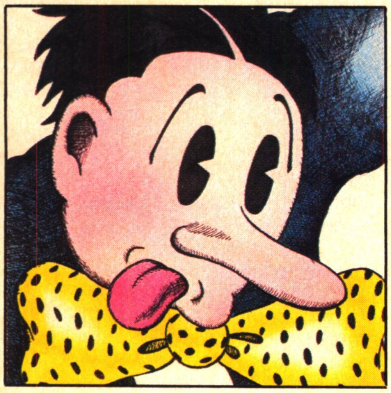
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COVER art© by Fred Crawford

📼 The small cassette tape symbols beside features and regular columns indicate that the program listings with those articles are on this month's RAINBOW ON TAPE, ready to *CLOAD* and *RUN*. For full details, check our RAINBOW ON TAPE ad on Page 220.

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NEXT MONTH: In direct response to our RAINBOWfest-Princeton survey, February will be our "Utilities Issue" because of the high interest in, and demand for, these programming helpers.

We'll also kick off RAINBOW's third annual Adventure contest in addition to our usual wide spectrum of articles and programs. Look for THE RAINBOW for more on the Color Computer than is available from any other source!

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The RAINBOW

January 1985 Vol. IV No. 6

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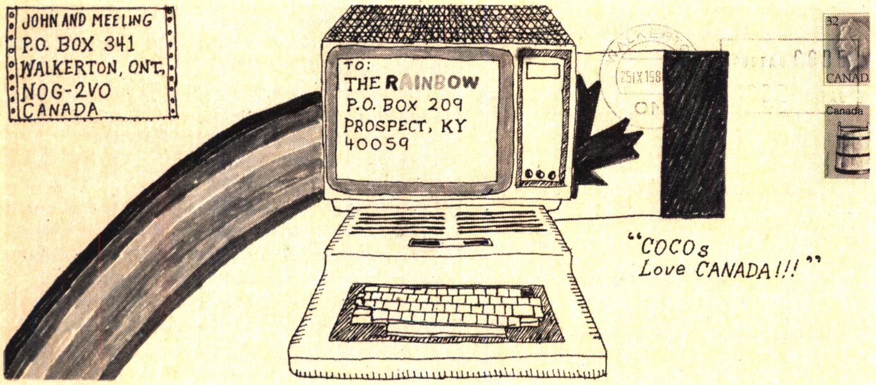
LETTERS TO THE RAINBOW

ARTS AND LETTERS



Envelope Of The Month

John and Meeling
Walkerton, Ontario

PRIDE AND PREJUDICE

Editor:

Whether you ever publish this in your magazine or not, I've held the pride I feel in your publication back far too long!

Unfortunately, I'm an old lady and cannot read the computer language and I deeply regret that. However, I read all the English parts I possibly can and love every minute of it.

I'm sure the staff is excellent and your Editor is very fortunate to have you. I couldn't be more prejudiced than I am to your Editor, because I am Lonnie's Mom.

Mildred C. Falk
Birmingham, AL

WHAT'S A MOTHER TO DO?

Editor:

Regarding your article in the October '84 issue of RAINBOW, "Everyone Wants More RAM . . . ," I am a new CoCo owner and a mother of four kids. If I want "my turn" it has to be when the kids are in school or in bed so I relate to your problem in terms of my own dilemma; not enough RAM in my days and not enough K's in my CoCo. The K problem I am going to deal with by having a 64K package and a double-disk drive added to my unit. As for getting my share of time with the unit, well, the kids will eventually leave home and I'll get more time on the CoCo then.

I am enjoying my computer, but for my money RAINBOW has really added something special to our family's computer experiences. Keep THE RAINBOW bright!

Kathy Fjeldsted
Lundar, Manitoba

MAKING A COMPROMISE

Editor:

I think THE RAINBOW is an excellent magazine and is well laid out. Keep up the good work.

In your article ["Building October's Rainbow," Page 16] on what to put in THE RAINBOW (re: long 64K programs vs. short programs and more dialogue), I have this suggestion. Yes, we would like to see good, long version programs, but how about a compromise? Split the long programs over a couple of monthly editions. I don't think we will mind much and it gives a rest in between listings on the key-in. It would be to your advantage, too — it gives you more pages for articles and maybe increased circulation. Those who buy off-the-shelf magazines will have to buy next month's or make requests for last month's if they only have the second half.

John Felker
St. Catharines, Ontario

BLUEPRINTS FOR THE BUILDER

Editor:

The computer desk plans that Lloyd Wing (October 1984, Page 7) and other computer buffs may be interested in are in *Mechanix Illustrated*, February 1984.

The plans offer a flexible arrangement with locked compartment and a slide-out tray holding the computer keyboard.

Although the desk is made out of red oak plywood in the article and is estimated to cost $180, a less expensive grade of material could be used with excellent results.

Thomas Remakel
Dubuque, IA

Editor:

I have been buying magazines for 29 years for the purpose of learning and improving my abilities. THE RAINBOW is by far the best I have read. Enough, too much flattery might cause you to byte your bits.

In the October 1984 issue was a request for the location of some home built computer table plans. I recommend the August 1984 *Popular Science.* There are several excellent computer table projects — winners of the annual plywood panel construction contest — well worth looking at and not expensive to build.

As for the already built, everybody with furniture is featuring some kind of computer furniture — at all kinds of prices.

Keep up the outstanding work and on to the next RAINBOWfest!

Robert A. Clark
Mooretown, NJ

ON THE HUMOROUS SIDE . . .

Editor:

It appears that in the October issue, "Information Please" section of the "Letters To THE RAINBOW" you must have left out much of Lloyd E. Wing's request, i.e., "I would like an example of both a purchased and homemade product: allowing for a monitor, disk drive and printer."

". . . another printer (for color), Y cable, ROM pack, another disk drive, cassette recorder, diskette filebox, another diskette filebox, chart and paper storage, six or more desk drawers, cassette filebox, another cassette filebox, notepad, pencil holder, trash basket, 20 gallon trash can — rubber, it hurts less when you kick it (Note: a 9600 Baud printer requires 33 gallons or better), desk lamp, aspirin holder, at least a 200-socket spike protected extension cord (a dedicated utility company may be substituted), modem, RS-232 switcher, printer interface, telephone, holder for THE RAINBOW magazines, bookcase, coffeepot with cup (an A.A. meeting list may be substituted), CoCo programming will require a change of socks and underwear (for all night sessions), calendar, radio, intercom (to let the family know of success — the sound of foot striking rubber trash can will suffice for failure), in-basket — nothing ever leaves, clock, checkbook (filled and solvent) a jillion stamps, envelopes, helpfully a Bible, picture of loved ones (for later comparisons), portable potty (not required if touch typist), dictionary for Adventures and a place to store joysticks . . ."

THE RAINBOW is doing Mr. Wing a great disservice by failing to correct his letter to a more realistic request.

DaDa and CoCo Hatton
Cockeysville, MD

HINTS AND TIPS

Editor:

I own a CoCo 2 which I recently upgraded to 64K. I found out that the IBM PC uses the same 4164 RAM chips. I was able to buy nine 150ns chips for $39 plus tax at an Austin PC store. So, when thinking of upgrading, check to see if there are any bargains at your local PC store before you settle for 200ns chips.

I've received a tremendous amount of enjoyment in the three months that I've owned my CoCo. The very first program I typed in was a "Sample Program #5" from the *Extended BASIC Manual.* If you like graphics, but don't enjoy typing long listings, you'll love this one. It is short and sweet. Be sure to make the following changes for different effects:

```
1) 3 POKE 65495,0
   5 PMODE 4,1
   10 PCLS
   15 SCREEN 1,1
   80 GOTO 20

2) delete lines 30,35,65,70
   replace Line 40 with:
   40 COLOR RND(4)-1,RND(4)-1
```

First do the changes in part 1 and *RUN*, then do the changes in part 2 and *RUN.*

Daniel Ortiz
Austin, TX

BACK TALK

Editor:

I have been copying listings from THE RAINBOW into my Color Computer, but found it quite tedious to keep glancing from the magazine to the keyboard to the CRT screen. The other night I was wishing I could persuade my wife to read the listings to me, when it suddenly occurred to me I could dictate the listings to a cassette tape, then play that back while typing in the program. With a little experimentation in speed, groupings of characters, etc., I found this a big improvement. I used a foot switch, which is available at Radio Shack, to control the recorder while typing the listings.

I hope this helps others as much as it has helped me.

Russell R. Yost
Phoenix, AZ

EDITING ERRORS

Editor:

I have discovered that it is easier to correct errors if you type *EDIT* and the line number (e.g., *EDIT 100*) then press 'X' and backspace to the error. If you run out of paper while printing something, you can press the SHIFT @ key which will pause it, change paper and then press any key to start printing.

Robert Bowlby
Spencer, WV

Editor:

To all you people who wound up with an Epson MX-80 printer and Radio Shack's Disk Color *Scripsit*, and found out all you could print was garbage: if you use the print spool feature of *Scripsit,* not only will the printer work, but you'll be able to work on something else while it's printing the spool file.

Thanks for one terrific magazine. you make the CoCo worthwhile.

Andrew R. Ilowit
Hollywood, FL

WITH A FLIP OF THE SWITCH

Editor:

I have recently purchased the 64K Disk version of *Coco-Accountant II* from Federal Hill Software and the RGS Micro Dual DOS Card from Software Support.

Coco-Accountant II is a very good program; in fact, I am using it to do the P.T.A. records. It does everything Federal Hill Software states, and is menu-driven.

The only problem is that the 64K Disk version is not compatible with JDOS. It must be used with Disk BASIC. This presented a problem in the beginning, as I did not know why the program did not function properly; however, with Federal Hill's help and assistance, we found that it was due to my use of JDOS. This is why I purchased the Dual DOS Card and Switch.

The directions that came with the Dual DOS Card were easy to follow and the installation was quickly performed. The hardest part was to drive a hole for the switch.

With this Card I can change from JDOS to Disk BASIC just by the flip of the switch and I don't have to worry about future incompatibility with JDOS.

Harold M. Bloom
Princeton, NJ

'CASTING' LINES

Editor:

If you would like to play *Gone Fishing* (THE RAINBOW, Jan. 1984, Page 158) and not have your line disappear, make the following changes in your program:

```
220 GET (125,128)-(135,136),M,G
600 LINE (149,40)-(149,K),PSET
610 PUT (140,K+0)-(150,K+6),M,PSET
```

Ted Mayor
East Greenbush, NY

POSITIVE OR NEGATIVE

Editor:

In the September 1984 issue [Page 6], Burnie Whiddon from Orlando gave a method of finding the exclusive OR of two integers. His method works for integers from 1 to 32767, but there is a simpler method to do the same thing and it works from -32767 to +32767. Of course, you have to know how the negative numbers are stored. Try the following lines:

```
10 INPUT"NUMBERS TO
   XOR";A,B
20 PRINT (A OR B) - (A AND B)
```

These will produce the desired XOR.

Mike Moore
Nepean, Ontario

ALL IN THE FAMILY

Editor:

As the publisher and exclusive marketing agent for the genealogical database *Family*, I would like to thank Mr. Howard Lee Ball for his praise of the program *Family* in a review of another genealogy program [*Ancestors 2.0* November 1984, Page 218]. The review states that Mr. Knight cooperated with the writer of *Ancestors* which is a disk-based system. *Family* was originally a tape-based system only.

We would like to inform the readers that Petrocci Freelance Associates has converted

Mr. Knight's *Family* to disk so it is now available on both tape and disk. The new disk version is $19.95. We feel it is only fair to Mr. Knight to make sure that readers know that his own program, *Family* is available in either format.

Susan Petrocci
Petrocci Freelance Associates
Tucson, AZ

Editor:

I am writing in response to the request of Mr. Dieter Klose in the November 1984 "Letters To THE RAINBOW" column. Mr. Klose inquired about computers and graphics printers for use in the production of his large-scale animated cartoon. Your Editor's Note suggested our program, *The Animator*, might help. While we thank you for the mention, I believe Mr. Klose had something else in mind. To set the record straight, *The Animator* does not support output to a graphics printer. A special "commercial version" of *The Animator* is being used by several graphics and advertising companies (making transfers directly to videotape). For Mr. Klose's purposes, we would recommend either a full-scale mainframe system or traditional film animation.

Stan Osterbauer, President
Triad Pictures Corp.
Sequim, WA

INFORMATION PLEASE

Editor:

Can someone send me a copy of the *Real Talker* "English to Phenome Dictionary?" They are no longer available from Colorware. I would be happy to pay for the copies. Thanks. Write to me at Rt.1, Box 103, 56444.

Gary Hansen
Deerwood, MN

Editor:

Congratulations on a fine magazine. Each month, with about five magazines of interest in the electronics field coming to me, yours rates tops.

I am interested in a program to help locate the settings for a TVRO (television receive only) antenna.

It would allow me to enter my latitude and longitude, degrees, minutes and seconds. Then the location of the desired satellite in the Smith Belt and tell me the elevation and degrees from true north to set the antenna.

With all the interest in earth stations, privately owned, if the program is not available maybe someone would be interested in writing one. A program writer I am not. Write me at Box 471, 44815.

Carl E. Nay
Bettsville, OH

Editor:

It has been suggested to me that your magazine might be able to assist me in finding out if there is a magazine subscription which might pertain to the MC-10 Color Computer put out by Radio Shack.

I am particularly interested in finding out what cassettes, if any, are available for this computer and where a person might obtain the same.

Ann Lobb
Hay River, Northwest Territories

Editor's Note: Please refer to Radio Shack's 1985 Catalog, Page 167.

GOLD IN ENGLAND

Editor:

As a refugee following the demise of *Chromasette*, I can see I have been missing a great deal in not subscribing to THE RAINBOW before now!

Do you have many readers in England? Maybe we can get some together to try and get reasonably priced software over here. Importing software from the United States results in having to pay six percent of value in customs charges and then VAT (tax at 15 percent on top of the converted dollar rate and the customs charge). The choice of non-Radio Shack software over here is severely limited.

Fancy finding the 'pot of gold' at the end of a rainbow over 4000 miles away. Isn't science wonderful!

Contact me at 14 Upcroft Ave., Edgware, Middlesex HA8 9RB England.

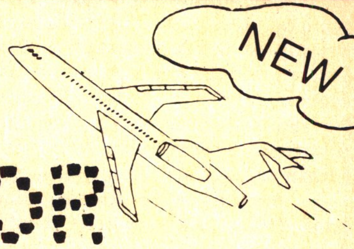
Norman Allen
Middlesex, England

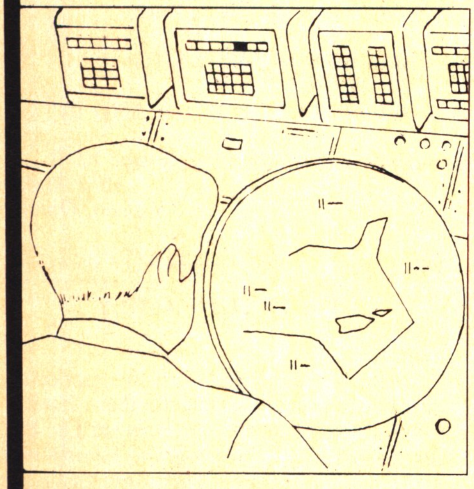
It's Here!

REALISTIC, FULL-FEATURED . . .

NEW

AIR TRAFFIC CONTROL SIMULATOR





You've heard about our crowded skys and the concerns for air travel safety. Have you ever wondered how the system works? Now YOU can learn. No aviation background is needed. This is a complete educational package which includes the following:

- Air Traffic Control Simulator software on cassette or diskette.
  - 100% machine language.
  - Dramatically exploits the CoCo's processing capability.
  - Simulates 40 mile x 10,000 ft. surveillance volume.
  - Realistic radar pesentation displays airborne and surface traffic.
  - Pilot-to-Tower/Tower-to-Pilot communications.
  - Develops ATC skills such as traffic separation, approach/departure vectoring, sequencing and tower procedures.
  - Scoring system provides feedback on controller performance.
  - Three levels of difficulty for beginners to experts.
- Comprehensive manual includes tutorial on Principles of Air Traffic Control.
- Communications quick reference card.

Will educate, entertain and impress CoCo users. Carefully engineered for the novice, yet will challenge the experts.

32K Machine Language. No Joysticks Required.
Tape $34.95 Disk $37.95

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- NO CHARGE for postage, handling or COD's.
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Color Power II is the CP/M computer which plugs into your Color Computer and marries its powerful Z-80A microprocessor with the outstanding 6809E microprocessor to allow you to run thousands of business programs including WordStar,® dBase II,® and SuperCalc II.™

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Many are developing hardware and software for use with **Color Power II.**

Double Density Software provides ULTRA TERM +, a communications program, and DOUBLE DOS II, an 80 column generator for Co Co basic. Morton Bay Software provides DOUBLE DRIVER, a monitor driver.

PRICES:

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ULTRA TERM +	$ 56.00
DOUBLE DOS II	$ 40.00
DOUBLE DRIVER or MONO II	$ 25.00

Call us or one of our dealers or send check, Visa or MasterCard number with expiration date. N.J. residents add 6% sales tax.

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Morton Bay Software
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DSL Computer Products, Inc.
P.O. Box 1176
Dearborn, Michigan 48121
313-582-8930

Micro R.G.S. Inc.
759 Victoria Square
Montreal H2Y 2J
800-361-5155

CP/M is a trademark of Digital Research, Inc. WordStar is a trademark of Micropro International Corp.
dBase II is a trademark of Ashton-Tate. SuperCalc II is a trademark of Sorcim Corporation.

PIRATE PENDENCY

Editor:

Please accept my compliments on the most valuable peripheral I buy for my Color Computer. The high point of my month is always the arrival of THE RAINBOW. I would also like to cast my vote in favor of an article or series on FORTH.

I would like to commend these suppliers: Prickly-Pear Software, Spectral Associates, Spectrum Projects, Tom Mix Software and Double Density Software.

Lastly, I would like to toss out a few comments about software piracy. My question is to the software vendors who deal exclusively, or almost so, in imitations of arcade games. What legal right do these companies have to copy arcade games without licensing them from the original manufacturers? I hear a lot of whining and screaming from these manufacturers about people stealing their software, but it seems to me a case of the pot calling the kettle black. I invite rebuttal from the manufacturers.

Richard P. Adams
Mesquite, TX

KUDOS

Editor:

This magazine definitely is the best CoCo magazine around! The programs are always new, creative and exciting. It makes me feel good when I read about new hardware or software because I know you really know what you're talking about.

Keep up the good work on your great magazine!

Todd Amodeo
Winthrop, MA

Editor:

Congratulations on the success of your magazine. I'm a subscriber of your colorful magazine. I live in Canada and I've been wondering why nobody thought of doing a RAINBOWfest here in Canada. Everybody is 'CoCo' about THE RAINBOW magazine here.

Serge Larecque
Montreal, Quebec

APPLAUSE, APPLAUSE!

Editor:

As the New Brunswick RAINBOWfest was excellent, the Princeton RAINBOWfest exceeded it by far. I must say that both shows were worthwhile.

I have many, many companies to thank. To start off, for the New Brunswick show, I must thank Mark Data Products for their excellent Super-Pro keyboard and Tom Mix software for their quick delivery of SR-71.

For the Princeton show there are many more companies to thank. First on the list is Computer Plus for their service and the great price on the Okidata Microline 92 printer. (Not to mention the Okidata company for the quality of the printer.) Next, I should mention Micro World II's friendliness and good price on *Sam Sleuth* by Computerware. (Anybody know where some more evidence is on level 2? Got them to the 'lot' but arresting them doesn't work!)

How about MichTron for their Mach II joysticks, for giving us a free *Mudpies* game, and for a good price on *Graphicom.* Yes, they do discount at RAINBOWfests! Thanks to Moreton Bay Laboratory for their *Bjork Blocks (Graphicom* and *Bjork Blocks* are perfect together).

I'd also like to commend Compukit Corporation. Their 64K upgrade for $38, including installation, was a bargain. Although we had some trouble with it, bringing the computer back the next day remedied the problem.

Finally, and most importantly, I'd like to thank THE RAINBOW for supporting the shows and especially the CoCo. You guys have done a great job and we wouldn't be here without you.

Thanks to all.

Eric W. Lund
Millington, NJ

Editor:

Just a line to let you know how much my buddies and I like your magazine, THE RAINBOW. You seem to have an endless supply of goodies. I always try to point a new CoCo owner in the right direction — right to RAINBOW, that is.

"Cooking With CoCo" by Colin J. Stearman is a good example. I have enjoyed every segment so far. He is a fantastic writer in my opinion.

You have too many great articles for anyone to mention them all. As for my CoCo getting lonesome, not as long as I can get a RAINBOW! But my fingers are getting a little stiff, so I also get RAINBOW ON TAPE.

Keep all those great articles, and great people working for us.

Harold Lame
Gallatin, TX

Editor:

On Sunday, September 30, 1984, the drawing for the soft sculpture doll was held at RAINBOWfest in Princeton, N.J. Drawing the tickets for the PJCCC was Willo Falk of THE RAINBOW magazine. Standing by as verifying official was Dan Downard of THE RAINBOW. The winner of the doll was Paul Eckhard, RR 1, Box 152, Palmerton, PA.

Penn-Jersey Color Computer Club
Easton, PA

The TMP FreeForm Filer *No Other Program Can Match It!

OUR CAPABILITIES:

THE SYSTEM: This fully prompted, menu driven program, with *"HELP"* available at any point in the program, gives you real *"EASE OF USE."*

As you enter or edit your text, you can select any word as a *"KEYWORD."* You don't have to type your keywords separately! Each *"CARD"* can contain as many as 117 keywords, and up to nine pages of text similar to a 3" x 5" card, with no field restrictions! Each *"FILE DRAWER"* can contain up to 32,767 pages per drawer!

THE EDIT: *"FULL TEXT EDITING,"* includes an onscreen editing menu, word wrap and the ability to move lines around in a file. Entire cards may be duplicated within a file drawer, making the use of *"STANDARD FORMS"* or *"TEMPLATES"* very easy!

THE SEARCH: You can *"SEARCH"* for the card title, your keyword, or a combination of both. *"WILD CARD SEARCHES"* give you even more powerful search capabilities, such as when you can't remember the spelling of a name!

THE RESULTS: You may list the titles of all cards found in your search, print those cards, or write them to a disk file for later printing or use with a word processor. Printing the cards gives you *"HANDS ON USE"* for maintaining office phone indexes, inventories, and appointment calendars. The FreeForm Filer *FILLS THE GAP* between traditional data base management and word processing programs!

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SMALL BUSINESS OWNERS: Inventory, service calls, vendor lists, sales orders, prospect notes, project status notes . . . the possibilities are endless!

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ATTORNEYS: You can easily find the names of those cases affected by a new court decision, or cases that need briefs filed next month!

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IN THE HOME: Again, the possibilities are endless . . . stamp and coin collections, home inventory, payment dates, Christmas card lists, and all your favorite recipes *RIGHT AT YOUR FINGERTIPS!*

OUR PPD* RATING IS THE BEST IN THE INDUSTRY!

***PERFORMANCE PER DOLLAR:** There are cheaper filing programs, but none with the power and performance of the FreeForm Filer.

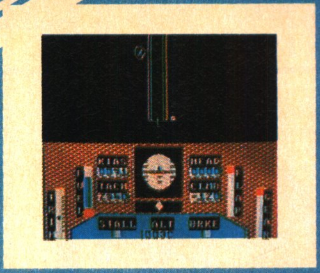
***A REVIEW BY RAINBOW MAGAZINE** said no other filing program "can match the abilities and capabilities" of the TMP/FreeForm Filer for "applications that require a lot of text, very variable search criteria, speed and efficiency."

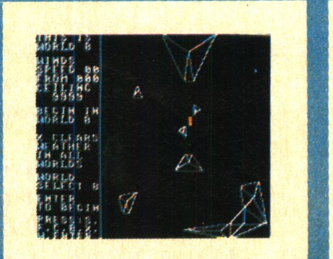
The TMP FreeForm Filer runs on OS-9 systems and requires 64K RAM, one disk drive, and an 80-column screen. (Also available for IBM-compatible computers, and Sanyo MBC 550 and MBC 555, Zenith Z-100, Canon AS-100 and CX-1, Victor 9000, and Tandy 2000.)

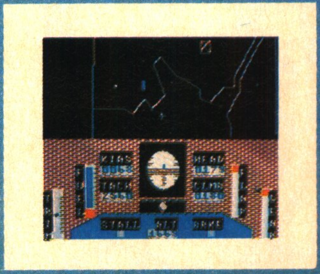
New From Tom Mix. . .

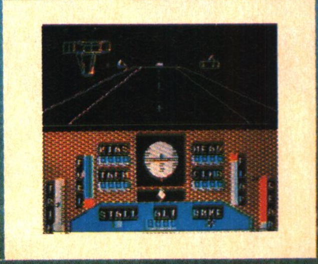
Worlds of FLIGHT

Not A Game — A Very Realistic Flight Simulation









WORLDS OF FLIGHT (WOF) is a "view" oriented flight simulation for the TRS-80 Color Computer, written entirely in Machine Language. "View" oriented means that the pilot may determine his or her position by actually viewing the surrounding landmarks as opposed to using instruments which sense navigational references. This is a major departure from "instrument only" simulations which can be achieved through BASIC programs. Most instrument maneuvers and procedures may be practiced. The craft is a light-weight, single-engine airplane with low wings. A nose wheel which is both steerable and retractable is also modeled. Some aerobatics are possible including sustained inverted flight, aileron rolls, spins and stalls.

JOYSTICKS REQUIRED
32K MACHINE LANGUAGE
TAPE $29.95 DISK $32.95

The Experts Say:

C.L. — "As a pilot I found "Flight" to be an outstanding simulation.

M.H. — "No one has created a more realistic flight simulator for the Color Computer."

D. HOOPER, pilot for major airline — "An outstanding flying experience. Very realistic."

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PRINT #-2,

I really can't think of a nicer time of the year — and the only thing that makes this time of the year bad is that it isn't really that time yet.

I guess I should explain. This is the January issue of THE RAINBOW, but it comes out in mid-December. However, in order for me to meet the deadlines that have been imposed, I have to write it in early to mid-November. So, while I am trying to project myself a month ahead — it is a little hard to do. I'll try.

Because this is the January issue, I think it is important to look at the year which has just ended (or is about to end) and the one that is coming up. First, a few observations about 1984:

George Orwell's society did not take us over during 1984, as neither I nor you really thought that it would. At the same time, we did see computers and machines doing more and more things for people than ever before.

The computer business, in particular, was a good and a bad one. It was good for those of us interested in the CoCo because tens of thousands of users were added to the ranks. At the same time, more and more people looked at the Color Computer for the first time and this has made it what may very well be the most popular low-cost computer going.

For some other people the computer business has not been particularly good. We keep hearing about "the shakeout" — and a lot of people "got shook out." Computer companies. Software houses. Magazines. I've written about all this before, so there is nothing new here. Just an end-of-year observation that Tandy Corporation/Radio Shack seems to be as strong or stronger than ever, while some other people seem to be weaker or non-existent.

Looking ahead, I see the trend continuing. The fact of the matter is that many of the companies which show "new computers" at big shows like COMDEX one year, are nowhere to be seen the next year. One case in point is close to home: Tano Corporation — which had a big display for its U.S. Dragon computer last year. This time around they are not even in the market.

Why don't a lot of these people succeed? That is one of the concerns I think needs to be answered in 1985. And, frankly, I think the answer is that they do not succeed because they don't have anything new that will really grab the market.

The same goes in software. And magazines. No one is going to make inroads into an established market unless they can build a better mousetrap. Someone once wrote a book entitled *To Catch A Mouse, Make A Noise Like A Cheese.* It was a good book and it makes a lot of sense. But, you have to have a better cheese than the guy who has been selling you a perfectly good wheel of cheddar for a couple of years, or why would anyone switch? Too many people in the computer market are expecting people to switch simply because they have arrived on the scene.

What we need in 1985 are new things. New computers. New software. And not just new software, but new concepts. New ideas. I remember when *VisiCalc* first came out — it was the first program that gave the businessperson something he could really use. Apple Computer Co. sold a lot of computers thanks to ads which showed *VisiCalc* running.

I hear that several people are working on new endeavors in a lot of areas. I hope the trend continues and makes it to the marketplace. New programs will make your CoCo an even better investment — you'll be able to do more. And, of even more significance, you'll be able to do things you did not consider it possible to do. That's truly significant.

I see something new coming from a hardware standpoint, too. Whatever comes from Radio Shack will, undoubtedly, be upwardly compatible. That is something I have written about before, and it is a major strong point for the Radio Shack and Tandy line of computers.

In short, I see 1985 as an exciting year! I think it is a year in which the CoCo Community will continue to grow and the support for our favorite computer

Telewriter-64™

the Color Computer Word Processor

- **3 display formats: 51/64/85 columns × 24 lines**
- **True lower case characters**
- **User-friendly full-screen editor**
- **Right justification**
- **Easy hyphenation**
- **Drives any printer**
- **Embedded format and control codes**
- **Runs in 16K, 32K, or 64K**
- **Menu-driven disk and cassette I/O**
- **No hardware modifications required**

THE ORIGINAL

Simply stated, Telewriter is the most powerful word processor you can buy for the TRS-80 Color Computer. The original Telewriter has received rave reviews in every major Color Computer and TRS-80 magazine, as well as enthusiastic praise from thousands of satisfied owners. And rightly so.

The standard Color Computer display of 32 characters by 16 lines without lower case is simply inadequate for serious word processing. The checkerboard letters and tiny lines give you no feel for how your writing looks or reads. Telewriter gives the Color Computer a 51 column by 24 line screen display with *true lower case characters*. So a Telewriter screen looks like a printed page, with a good chunk of text on screen at one time. In fact, more on screen text than you'd get with Apple II, Atari, TI, Vic or TRS-80 Model III.

On top of that, the sophisticated Telewriter full-screen editor is so simple to use, it makes writing fun. With single-letter mnemonic commands, and menu-driven I/O and formatting, Telewriter surpasses all others for user friendliness and pure power.

Telewriter's chain printing feature means that the size of your text is never limited by the amount of memory you have, and Telewriter's advanced cassette handler gives you a powerful word processor without the major additional cost of a disk.

> *...one of the best programs for the Color Computer I have seen...*
> — Color Computer News, Jan. 1982

TELEWRITER-64

But now we've added more power to Telewriter. Not just bells and whistles, but major features that give you total control over your writing. We call this new supercharged version Telewriter-64. For two reasons.

64K COMPATIBLE

Telewriter-64 runs fully in any Color Computer — 16K, 32K, or 64K, with or without Extended Basic, with disk or cassette or both. It automatically configures itself to take optimum advantage of all available memory. That means that when you upgrade your memory, the Telewriter-64 text buffer grows accordingly. In a 64K cassette based system, for example, you get about 40K of memory to store text. So you don't need disk or FLEX to put all your 64K to work immediately.

64 COLUMNS (AND 85!)

Besides the original 51 column screen, Telewriter-64 now gives you 2 additional high-density displays: 64 × 24 and 85 × 24!! Both high density modes provide all the standard Telewriter editing capabilities, and you can switch instantly to any of the 3 formats with a single control key command.

The 51 × 24 display is clear and crisp on the screen. The two high density modes are more crowded and less easily readable, but they are perfect for showing you the exact layout of your printed page, *all on the screen at one time*. Compare this with cumbersome "windows" that show you only fragments at a time and don't even allow editing.

RIGHT JUSTIFICATION & HYPHENATION

One outstanding advantage of the full-width screen display is that you can now set the screen width to match the width of your printed page, so that "what you see is what you get." This makes exact alignment of columns possible and it makes hyphenation simple.

Since short lines are the reason for the large spaces often found in standard right justified text, and since hyphenation is the most effective way to eliminate short lines, Telewriter-64 can now promise you some of the best looking right justification you can get on the Color Computer.

FEATURES & SPECIFICATIONS:

Printing and formatting: Drives any printer (LPVII/VIII, DMP-100/200, Epson, Okidata, Centronics, NEC, C. Itoh, Smith-Corona, Terminet, etc).

Embedded control codes give full dynamic access to intelligent printer features like: underlining, subscript, superscript, variable font and type size, dot-graphics, etc.

Dynamic (embedded) format controls for: top, bottom, and left margins; line length, lines per page, line spacing, new page, change page numbering, conditional new page, enable/disable justification.

Menu-driven control of these parameters, as well as: pause at page bottom, page numbering, baud rate (so you can run your printer at top speed), and Epson font. "Typewriter" feature sends typed lines directly to your printer, and Direct mode sends control codes right from the keyboard. Special Epson driver simplifies use with MX-80.

Supports single and multi-line headers and automatic centering. Print or save all or any section of the text buffer. Chain print any number of files from cassette or disk.

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File and I/O Features: ASCII format files — create and edit BASIC, Assembly, Pascal, and C programs, Smart Terminal files (for uploading or downloading), even text files from other word processors. Compatible with spelling checkers (like Spell 'n Fix).

Cassette verify command for sure saves. Cassette auto-retry means you type a load command only once no matter where you are in the tape.

Read in, save, partial save, and append files with disk and/or cassette. For disk: print directory with free space to screen or printer, kill and rename files, set default drive. Easily customized to the number of drives in the system.

Editing features: Fast, full-screen editor with wordwrap, block copy, block move, block delete, line delete, global search and replace (or delete), wild card search, fast auto-repeat cursor, fast scrolling, cursor up, down, right, left, begin line, end line, top of text, bottom of text; page forward, page backward, align text, tabs, choice of buff or green background, complete error protection, line counter, word counter, space left, current file name, default drive in effect, set line length on screen.

Insert or delete text anywhere on the screen without changing "modes." This fast "free-form" editor provides maximum ease of use. Everything you do appears immediately on the screen in front of you. Commands require only a single key or a single key plus CLEAR.

> *...truly a state of the art word processor... outstanding in every respect.*
> — The RAINBOW, Jan. 1982

PROFESSIONAL WORD PROCESSING

You can no longer afford to be without the power and efficiency word processing brings to everything you write. The TRS-80 Color Computer is the lowest priced micro with the capability for serious word processing. And only Telewriter-64 fully unleashes that capability.

Telewriter-64 costs $49.95 on cassette, $59.95 on disk, and comes complete with over 70 pages of well-written documentation. (The step-by-step tutorial will have your writing with Telewriter-64 in a matter of minutes.)

To order, send check or money order to:

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Or check your local software store. If you have questions, or would like to order by Visa or Mastercard, call us at (619) 755-1258 (weekdays, 8AM-4PM PST). Dealer inquiries invited.

(Add $2 for shipping. Californians add 6% state tax. Allow 2 weeks for personal checks. Send self-addressed stamped envelope for Telewriter reviews from CCN, RAINBOW, 80-Micro, 80-U.S. Telewriter owners: send SASE or call for information on upgrading to Telewriter-64. Telewriter-compatible spelling checker (Spell 'n Fix) and Smart Terminal program (Colorcom/E) also available. Call or write for more information.)

Apple II is a trademark of Apple Computer, Inc.; Atari is a trademark of Atari, Inc.; TRS-80 is a trademark of Tandy Corp; MX-80 is a trademark of Epson America, Inc.

OWLS NEST SOFTWARE
' WE GIVE A HOOT '

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LABEL III – Name and address file-print system. With **LABEL III** you can develop and maintain a mailing list. Print lists or mailing labels in your choice of 1, 2, or 3 wide. Supports 3 or 4 line addresses with phone optional, FAST machine language sort by last name, first name, or zip code.

Cassette 16K EXT - Postpaid $19.95

RAINBOW CERTIFICATION SEAL

FILEIII - Data Management System
With **FILEIII** you can create and maintain records on anything you choose. Recipes, coupons, household records, financial records - you name it. You create records containing up to five fields you define. You can search, sort, modify, delete, save on tape and display on the screen or send to a printer. The program is user friendly and user proof. Prompting is extensive. A comparable program could cost much more. This one is a bargin!
Cassette 16K EXT - Postpaid $19.95

RAINBOW CERTIFICATION SEAL

PROGRAM FILE (Reviewed in Oct. '83 Rainbow)
Organize your cassette programs. With **PROGRAM FILE** you create a file of your computer programs. You can search, sort, modify, add, delete, save on tape, and display on screen or printer.
Cassete 16K EXT - Postpaid $14.95

NEW!!

INTRODUCING! - CODE CONVERTER Secrurity System
CODE CONVERTER will protect your basic and ML programs from unauthorized use. A simple code of your choice encodes your programs. Basic program listings will be scrambled and inoperative. Machine Language will not operate. Coded programs can be copied but are useless until properly decoded.
Cassette 16K EXT - Postpaid $19.95

RAINBOW CERTIFICATION SEAL

ADVENTURE STARTER (Reviewed in Feb.'84 Rainbow)
Learn to play those adventures the painless way. You start with a simple adventure and move into an intermediate. Two complete seperate adventures plus hints and tips on adventuring. Finish this and you are ready for ATLANTIS!
Cassette 16K Ext - Postpaid $17.95

RAINBOW CERTIFICATION SEAL

ATLANTIS ADVENTURE (Reviewed in May'84 Rainbow)
This one is tough! We challenge you to complete this in 30 days! If you can we will send you any program we sell - Postpaid - at absolutely no charge. You start on a disabled sub near the lost city of Atlantis. You must get the sub (and yourself) safely to the surface.
Cassete 16K EXT - Postpaid $21.95

RAINBOW CERTIFICATION SEAL

ESPIONAGE ISLAND ADVENTURE (Reviewed June'84)
You have been dropped off on a deserted island by submarine. You must recover some top secret microfilm and signal the sub to pick you up. Problems abound in this 32K adventure.
32K EXT - Postpaid Disk - $20.95 Cassette $17.95

RAINBOW CERTIFICATION SEAL

KINGDOM OF BASHAN
Our most involved adventure to date. Bashan has a large vocabulary and some unique problems to solve. You must enter **BASHAN** (not easy), gather the ten treasures of the kingdom while staying alive (even harder), and return to the starting point (harder yet). If you can get the maximum 200 points in this you are an expert!
32K EXT - Postpaid Disk - $20.95 Cassette $17.95

RAINBOW CERTIFICATION SEAL

FOUR MILE ISLAND (Reviewed May '84)
You are trapped inside a disabled nuclear power plant. The reactor is running away! You must bring the reactor to a cold shutdown and prevent the "China Syndrome". Can you save the plant (and yourself)? It's not easy!
Cassette 16K EXT - Postpaid $17.95

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will continue to expand. I believe newer and better things are on the horizon. And, with the Color Computer on sale now, almost everyone has a chance to buy the best single machine available, dollar-for-dollar, on the market today. I hope you will do your friends and neighbors a favor and expose them to your CoCo in the days before and those following the holiday season.

I should also mention that RAINBOWfest in Irvine, Calif., will be in February. These shows are always a great deal of fun, as well as an opportunity to see the CoCo Community at its best. We have special rates at the Irvine Marriott for the show and hope that thousands of you will join us in sunny, Southern California for the midwinter meeting.

There are a host of seminars and lots of exhibitors planning to attend. So, check out the registration form in this month's issue and let us know that you will be with us.

Last, but certainly not the least, this is the most appropriate time of the year to say "thank you" to the tens of thousands of you who are members of the CoCo Community, who support THE RAINBOW, and who use and love your Color Computer. We started this magazine three and a half years ago with the idea of serving people who owned a CoCo, even though it didn't yet have that nickname.

We have been able to serve you, I feel, largely through *your* support of *us* — writing or calling us with suggestions; telling advertisers that you saw their ads in the magazine; submitting programs for publication; participating in our contests; and a whole host of other things. We truly could not have THE RAINBOW without each of you.

I hope this season of the year is a happy, healthy and prosperous one for you and yours. I look forward to being with you for an even better year ahead.

Happy Holidays and happy 1985.

— Lonnie Falk

One-Liner Contest Winner . . .

This shows how the notorious "*PMODE4* color artifacts" create a color picture on your set from what is really a black and white video signal. It's also very nice to look at.

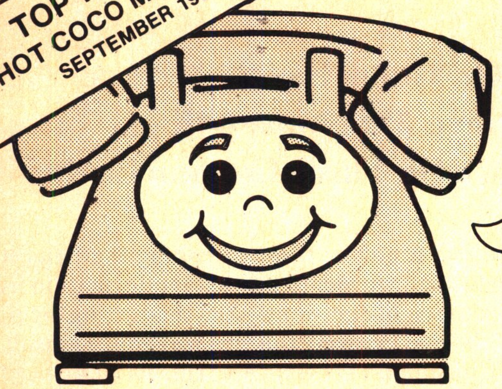
Mike Napolitan
W. Springfield, MA

The listing:

```
1 DIMA(11):W=20:FORC=4TO5:PMODE4
,1:PCLS:SCREEN1,1:GET(4,4)-(24,2
4),A,G:FORX=C TO228STEP2:Y=X*.75
:Z=174-Y:PUT(X,Y)-(X+W,Y+W),A,NO
T:PUT(X,Z)-(X+W,Z+W),A,NOT:PUT(X
,86)-(X+W,106),A,NOT:NEXT:FORT=1
TO500:NEXTT,C:FORB=1TO9999:NEXT
```

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Adventure* and its companion *Rainbow Adventure Tape*.)

TOP RATINGS
HOT COCO MAGAZINE
SEPTEMBER 1984



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Talks to other computers with Full or Half Duplex; Baud Rate of 110, 150, 300, 600, 1200; Parity as even, odd, mark, space, none; 7 or 8 bit Word; any Stop Bits; all 128 ASCII characters; true line Break; XON/XOFF protocol; and optional line-at-a-time transmission. Able to send and receive text, block graphics, BASIC and ML programs. A 64K machine holds up to 46,600 characters (34,900 in HI-RES).

DUAL PROCESSING lets you review & edit while more data is coming in.

Fully supports D.C. Hayes and other intelligent modems.

Talks to your printer with any page size, margins, line spacing, split word avoidance. Embed your printer's control sequences for boldface, underlining, etc. Narrow text can be automatically spread out.

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You can display directories, delete files, transmit directly from disk, and work with files larger than memory. Easily maintain a disk copy of an entire session.

Compatible with TELEWRITER (ASCII) & other word processors.

SMOOTH WALKIN'

AUTOTERM moves smoothly and quickly between word processing and intelligent terminal action. Create text, correct your typing errors; then connect to the other computer, upload your text, download information, file it, and sign-off; then edit the received data, print it in an attractive format, and/or save it on file.

Editing is super simple with the cursor. Find strings instantly, too! Any operating parameter, such as screen width, can be altered at any time. Uncompleted commands can be cancelled.

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The word processor can be used to create, print, and/or save on file your personal KSMs. They let AUTOTERM act like you. For example, it can dial through your modem, sign-on, interact, perform file operations, & sign-off; an entire session without your help. KSMs can answer the phone, prompt the caller, take messages, save them, hang-up, and wait for the next call. The KSM potential is unbelievable! NO OTHER COMPUTER IN THE WORLD CAN MATCH YOUR COCO'S AUTOMATIC TERMINAL CAPABILITIES!!!!!

WHAT THE REVIEWERS SAY

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Randolf W. Graham
the RAINBOW, June, 1983

"The Autoterm buffer system is the most sophisticated — and one of the easiest to use..."

W.C. Banta
HOT CoCo, September, 1984

"Almost a full featured word processor..."

Ed Ellers
the RAINBOW, November, 1984

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Rainbow 'Excellent' Or 'Good' Say 98.8 Percent . . .
Some 94 Percent Have 32K, Most 64K . . .
Two-Thirds Frown On Three Column Listings . . .

When we decided to conduct a poll of those attending the Princeton RAINBOWfest, we knew that in order to get useful information from a survey you have to ask the right question — and that asking the right question is tricky business. Nonetheless, knowing full well we should consult an expert, such as the University of Cincinnati's Dr. Sam Sherrill, whose advice has appeared in RAINBOW, we instead gathered an ad hoc committee of those not busy on something else and developed questions based on a popular, if not professional, technique: "Hey, I know, let's ask how . . . "

Well, the results of the Princeton poll are in, and I believe we learned several things of value in addition to a great deal about taking future polls. In evaluating the results, we have kept in mind that those attending RAINBOWfest cannot be presumed to represent the entire RAINBOW readership. That is, as a group, those who came to the show were probably among the more dedicated users — likely more sophisticated in terms of hardware and software than readers who did not attend. After all, those attending traveled, on the average, some 136 miles to attend the Princeton show.

So, further caveats aside and with apologies to Sam, here (reported in percentages of those responding) are the highlights of what we found:

Present System:

Size:	4K	0.3
	16K	5.9
	32K	12.6
	64K	81.2
BASIC:	Color	4.7
	Extended	54.9
	Disk	40.4

Printer:

Make:	Radio Shack	54.2
	Other	45.3
Type:	Dot Matrix	86.6
	Letter Quality	8.1
	Color	2.8
	Other	2.5

Display:

Kind:	B&W TV	16.0
	Color TV	65.2
	TV/Video Monitor	8.8
	Computer Monitor	10.1

DOS Used:

Disk BASIC	84.0
OS-9	12.0
FLEX	2.5
Star-DOS	1.5

Software Most Likely To Buy:

Utilities	23.0
Games	19.3
Word Processing	17.5
Home Uses	14.1
Education	13.0
Art/Graphics	11.0
Business	1.5
Music	0.6

Items Most Interested In Buying:

Disk Drives	17.8
More Memory	13.4
Printer	12.1
Modem	10.2
Speech/Sound Synthesizer	10.0
Monitor	7.5
Graphics Tablet	6.2
New Operating System	5.6
Expansion Unit	5.1
CP/M Adapter	4.1
Joysticks	3.4
Remote Device Control	2.8
Videodisc Player	1.9

I Rate THE RAINBOW:

Excellent	80.8
Good	18.0
Fair	1.1
Poor	0.1

Average Number of Recent Purchases Through RAINBOW Ads:

Total	6.8

I would like to see THE RAINBOW offer more:

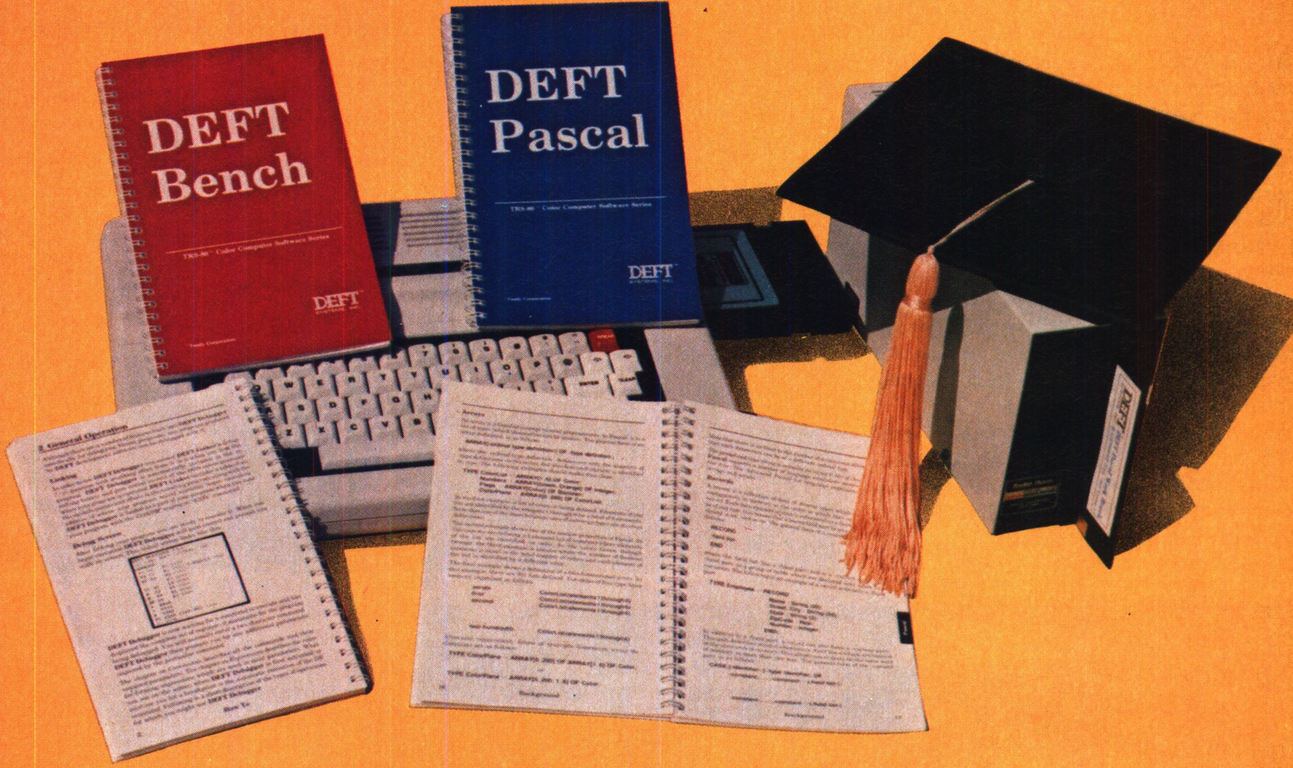
Utilities	18.6
Machine Language Info.	15.7
Hardware Projects	12.6
Educational Programs	11.0
Business Programs	10.5
Reviews	10.2
Tutorials	10.1
Games	8.6
Other	2.9

I think your Product Reviews are:

Just right	72.5
Too short	4.9

(Continued on Page 176)

Graduate With DEFT Pascal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RAINBOWfest REPORT

Bright lights and a crush of people crowded the Computize booth throughout the run of RAINBOWfest-Princeton, Sept. 28-30, as Ken Klosinski and his crew made "video snapshots" of show-goers using the Graphicom Video Digitizer. Meanwhile, Frank Hogg and his helpers were showing off "Nomad," a little personal robot that rode around under CoCo control. Bob Rosen, of Spectrum Projects, seemed to have more show special signs than anyone could be expected to read. But, it was our RAINBOW readers who really took the cake — birthday cake.

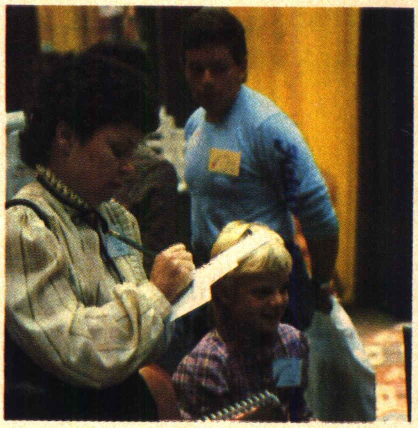
We've been sworn not to repeat Lonnie Falk's age, so, we'll only state it one time that he'd just turned 42. He wanted to celebrate the occasion with those attending RAINBOWfest — thus, cake for all.

Radio Shack
Radio Shack

1

CPU Color Power Unlimited

2



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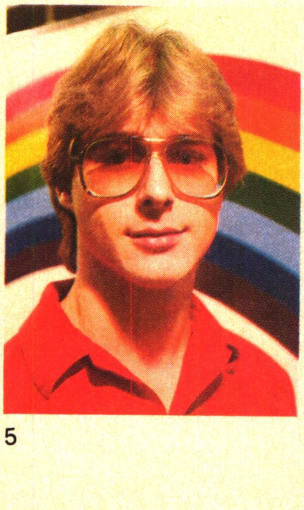

5

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TIME BANDIT

6

We have no statistics on how many dozen eggs, pounds of sugar or cups of flour went into the cake that served thousands, but if it's numbers you want, we have compiled the results from the survey we made of those attending "CoCo's very own show." For the highlights, see Jim Reed's column on Page 16 of this issue. A name was drawn from those responding to the survey and Michael J. Clancy, a real estate consultant from Jessup, Md., won himself a color graphics printer, just for filling out the survey form.

Was this a show for computer die-hards? Well, while Julie A. McGee, director of software development for Tandy Home Education Systems, drew a full house as keynoter at the CoCo Community Breakfast, Saturday morning, one of the most celebrated students from nearby Princeton University, Brooke Shields, went almost unnoticed by the CoCo crowd as she brunched Sunday morning in the hotel coffee shop.

As with all our RAINBOWfests, the Princeton show ran at an accelerated pace in order for everyone to meet as many people, exchange as much information, and interact as much as possible in our brief time together. And, nobody worked harder than Jerry Behler and the members of the Penn-Jersey Color Computer Club, who helped us publicize and run the show. Our thanks, Penn-Jersey, for helping, and our thanks to all the many CoCo clubs and individuals whose attendance makes these shows possible.

Next stop, Irvine, Calif. We do hope you'll join us.

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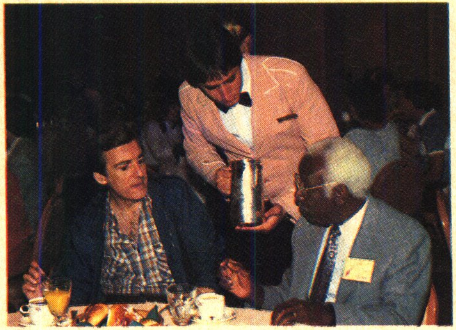
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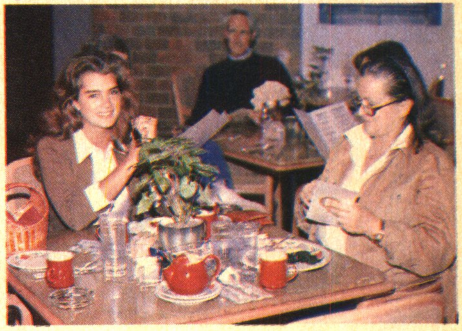
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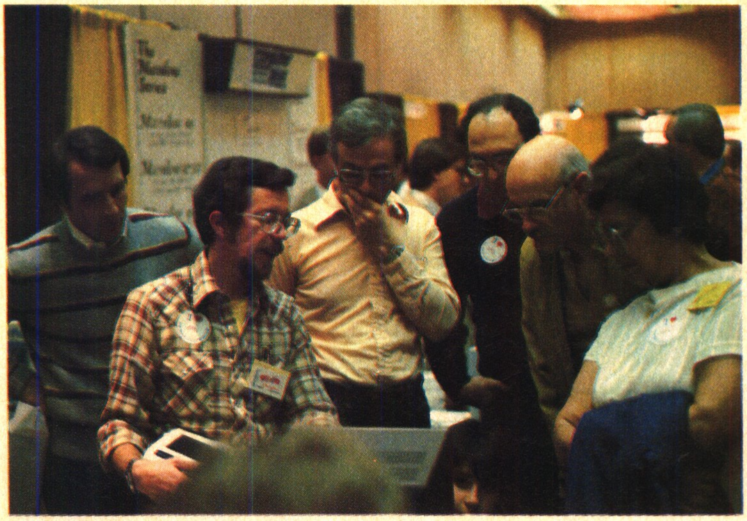
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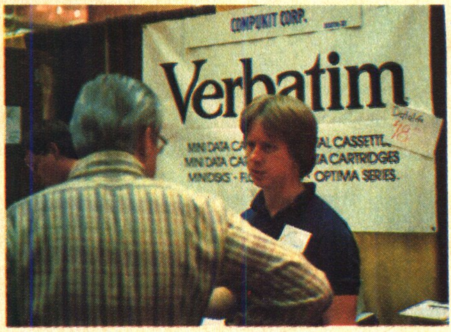
I ♥
I'M USER FRIENDLY
12



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The Pictures: (1) Al Alberta draws a crowd at the PBJ, Inc. booth. (2) Jack Torres of Computer Plus shows a new printer to Hot CoCo publisher Jeff Detray (blue shirt). (3) A computing family takes note of a bargain at one of the many vendor display booths. (4) Claire Manfredonia apparently caught her fingers in a joyport during a voltage surge. (5) Programmer Bill Dunlevy *(Cashman, Time Bandit)* worked with the MichTron crew. (6) One of Bill's programs gets a workout from a young challenger, one of 8,600 attending the Princeton show. (7) Tandy's Julie McGee with Rainbow's Lonnie Falk at the CoCo Community Breakfast. (8) Also at the head table, Cheryl Blyn, of Computer Island, (left) with Sugar Software's Susan Davis. (9) Nearly 500 attended the breakfast, Saturday morning. (10) While the CoCo crowd was upstairs in the exhibit hall, Brooke Shields and her mother went *almost* unnoticed at brunchtime Sunday in the Hyatt coffeeshop. (11) Artist Paul Hoffman helps out at Owl-Ware. (12) Even the merchandise was friendly at the Penn-Jersey display. (13) Al Timme of Hard Drive Specialists (formerly Compukit Corp.).

14

(14) RAINBOWfest is a good place to make a close examination of hardware products. (15) The milling crowd of CoCo enthusiasts filled the Regency Ballroom at the Hyatt. (16) Frank Hogg discusses *Dynacalc* with visitors to the FHL booth. (17) Bob Beckett responds to a roving CoCo crew. (18) It's hard to beat this CoCo artistry. (19) Paul Kush fields a question at Derringer Software. (20) Pat Endicott had a bargain corner at Endicott Software.

17

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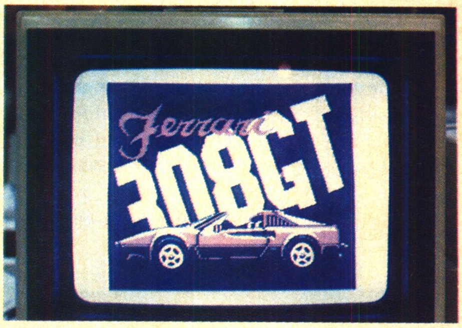
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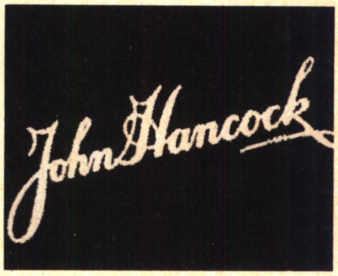

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GRAPHICS TUTORIAL 16K ECB

It Is Better To PUT Than To GET

By Alexander B. Trevor

A little experience with Extended Color BASIC graphics will make it obvious that by far the fastest way to place graphics elements on the screen is with the *PUT* statement. In fact, it is almost the only way to implement any kind of animation on the Color Computer in BASIC. Most descriptions of *PUT* tie its use to the *GET* statement, although this does not have to be the case, as we shall see. (Radio Shack's *Going Ahead With Extended Color BASIC,* pages 67-71, and *Color Computer Graphics,"* by William Barden, Jr., pages 143-154 are two examples). This is not too surprising, since the two statements are intended to be complementary. The idea is the *GET* will copy graphics data out of a specified rectangular area on the graphics screen, and save it in an array. The *PUT* statement allows you to place the data back on the screen at the same or another location.

In a typical game application, a number of "sprites" (such as rockets, robots, lunar landers, etc.) will be defined at the beginning of the program and then used with *PUT* statements throughout the game. The usual method of defining the sprites is to use the *DRAW* command to (slowly) draw each sprite on the graphics screen; then, each sprite is stored in a separate array with the *GET* command.

There are several problems with this method, though none of them may be serious in many applications: first, the *DRAW* command must be done on a separate graphics page, or it will deface anything that is already on the page. This is an important consideration for graphics editors, which may allow you to work on an image already in graphics memory, but not important in any program that clears the graphics page upon start up. Second, if there are many items to be drawn, the setup process can cause a noticeably long delay. Third, after *GETting* graphics into an array the contents of the array become "invisible," and cannot be printed to the screen, tape or disk. The *GET* command purposely trashes part of the array header to cause this undesirable side effect.

The method described here avoids these problems through an alternate way to load arrays with graphics data that can be used in a *PUT* statement. To use this technique, it is necessary to understand the format that data is stored on the screen, and also the nature of arrays. Rather than attempt to describe all the possibilities, I will limit this discussion to *PMODE 4*, the high resolution mode consisting of 256 horizontal elements (pixels) and 192 pixels vertically. The technique is easily extended to other graphics modes.

In *PMODE 4*, each byte in the graphics page contains eight pixels along the horizontal. Since there are 256 pixels on each line, it takes 32 bytes to hold the first line. There are 192 lines in the entire picture, or 6,144 bytes. Data for *GET* and *PUT* is stored in a similar scheme. If you *GET* a 5 x 4 area into an array, you are storing 5 x 4, or 20 pixels. In this case one pixel requires one bit of storage. The pixels are stored tightly packed in the array, with the upper left hand pixel stored as the most significant bit of the zero byte of the array. Since each byte can contain eight bits, this graphic will require only three bytes. For example a lowercase 'v' might appear on the screen like this:

```
Graphics Screen Area (5 horiz x 4 vert)

              Column
              1     2     3     4     5

Row 1:        1     .     .     .     1
Row 2:        1     .     .     .     1
Row 3:        .     1     .     1     .
Row 4:        .     .     1     .     .

As stored in the array;

   Byte 1:   1 0 0 0 1     1 0 0
             (row 1)    (row 2, 1-3)
```

(Alexander Trevor, who holds a master's degree in electrical engineering, is executive vice president of Computer Resources at CompuServe, and is a member of the IEEE and the ACM. In his "spare time" he writes software for CompuServe's DEC-10 mainframes and for a variety of microcomputers.)

Byte 2: 0 1 0 1 0 1 0 0
(row 2, 4-5) (row 3) (row 4, 1)

Byte 3: 0 1 0 0 0 0 0 0
(row 4, 2-5) (fill)

Arrays in Extended Color BASIC consist of elements that are five bytes each. Five bytes are necessary to hold a floating point number with the precision used in ECB, but the five bytes have no bearing on the graphics use of arrays except to make dimensioning and loading more confusing. In the above example, the three bytes will fit easily into the five bytes that will be allocated to a single array element.

How do we get three bytes of data into the first three bytes of a five byte integer array element? First, we must find out the address of the array element with the *VARPTR* statement — one of the less frequently used BASIC commands. Then, we *POKE* the data into the memory locations reserved for the array. That's all there is to it! The array can now be used in a *PUT*.

To see how this works in practice, let's follow through the example of a lunar lander sprite as shown below. The sprite is drawn in a rectangular area on the graphics screen eight columns wide and seven rows high:

	Column 0	1	2	3	4	5	6	7	Hex Value
Row 1:	.	.	1	1	1	1	.	.	2C
Row 2:	.	1	1	1	1	1	1	.	7E
Row 3:	.	1	1	1	1	1	1	.	7E
Row 4:	.	1	1	1	1	1	1	.	7E
Row 5:	.	.	1	.	.	1	.	.	24
Row 6:	.	.	1	.	.	1	.	.	24
Row 7:	.	1	1	.	.	1	1	.	66

In this example, it is particularly easy to determine the value to be poked into the array because the graphics area is exactly eight pixels wide. Thus, an entire row of pixels fits exactly into one byte of the array. In cases where the rectangle width is not a multiple of eight (such as the example of the lowercased 'v' above), you may wish to draw the graphic on the screen using any method (*DRAW* command, or graphics editor), then use the program given in Listing 1 to print out the appropriate values.

Listing 2 is a complete example for the *"PUT without GET"* technique. In Line 20, four graphics pages are reserved. Line 30 sets the horizontal and vertical size of the array. These values (HSIZE and VSIZE) are then used to *DIM*ension the array LL. HSIZE*VSIZE is the number of pixels; this is divided by eight bits per byte and five bytes per array element (i.e., 40), and rounded to the next integral byte. A subroutine to load the graphics array LL is called from Line 50, while lines 60-90 simply *PUT* the element on the graphics screen. The symbol setup routine (lines 100-170) is the key to the technique. In Line 110, all variables to be used within the subroutine are referenced. *This is absolutely necessary* in order to prevent the location of the array from changing after the *VARPTR* statement. If an undefined variable is encountered by BASIC, all variables are relocated in memory, invalidating the address returned by the *VARPTR* statement in Line 120. With an accurate address for the zero element of LL in variable P, the data is *POKEd* into each byte of the array in Line 150. In a variation of this method, the graphics data can be read in from disk or tape rather than from the *DATA* statements.

I have found this technique particularly useful for programs that use a number of sprites, and in which it was desirable to reduce the setup time to a minimum. Next time you want to speed up a graphics program, *PUT* something you didn't *GET*. You'll be rewarded with a faster program.

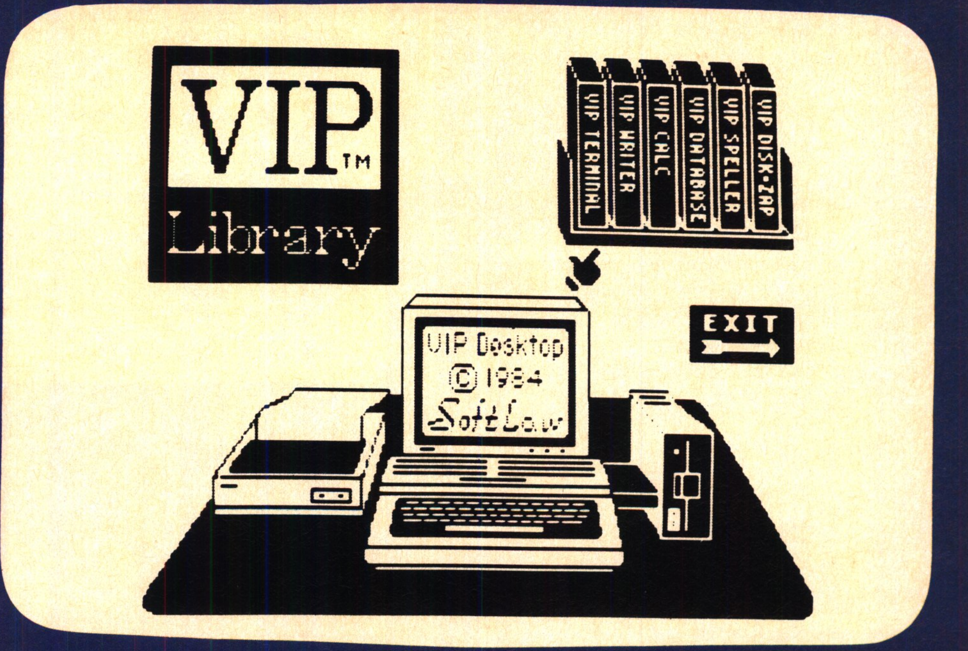
Listing 1:

```
10 ' PRINT DATA FOR A "PUT"
20 ' USE AFTER DRAWING GRAPHIC
30 X=100: Y=100 'UPPER L CORNER
40 HSIZE=8 'SET HORIZONTAL SIZE
45 VSIZE=7 'SET VERTICAL SIZE
50 DIM LL(HSIZE*VSIZE/40+1)
55 'VARIABLES MUST BE REFERENCED
56 'BEFORE CALLING VARPTR
60 I=0: P=0: J=0
70 GET(X,Y)-(X-1+HSIZE,Y-1+VSIZE
),LL,G
80 P=VARPTR(LL)+12
90 FOR I=0 TO HSIZE*VSIZE/8-1
100 IF J=0 THEN PRINT:PRINT"DATA
 ";
110 PRINT HEX$(PEEK(P+I));
120 IF J>6 THEN J=0 ELSE J=J+1:P
RINT",";
130 NEXT
140 PRINT"0"
```

Listing 2:

```
10 ' GRAPHICS PUT WITHOUT GET
20 PCLEAR 4: PMODE 4
30 HSIZE=8:   VSIZE=7
40 DIM LL(HSIZE*VSIZE/40+1)
50 GOSUB 100
60 PCLS:      SCREEN 1,1
70 X=100:     Y=100
80 PUT(X,Y)-(X-1+HSIZE,Y-1+VSIZE
),LL,PSET
90 GOTO90
100 'SYMBOL SETUP SUBROUTINE
110 I=0: T$="    ": P=0   'MUST
USE VARIABLES BEFORE VARPTR!
120 P=VARPTR(LL(0))
130 FOR I=0 TO HSIZE*VSIZE/8-1
140 READ T$
150 POKE P+I,VAL("&H"+T$)
160 NEXT
170 RETURN
180 'LUNAR LANDER SYMBOL
190 DATA 3C,7E,7E,7E,24,24,66
```

Direct a Symphony™ on Your Color Computer



with VIP Integrated Library™

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Finally, you can have the power and integration of Lotus Symphony™, 1 2 3™ or Open Access™ for the larger micros on your Color Computer! The convenience of instant changes to a new application and effortless transfer of files is at the tip of your finger.

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Available
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At Your Local
Radio Shack
Store!

Ask to see
the demonstration diskette.

Radio Shack Cataloge No. 90-0213

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". . .PICTURE getting your instantaneous investment report with your modem, using it in a spreadsheet calculation, making a report, and writing a memo including that report and data from your database with your word processor - all this power without leaving VIP Desktop! . . ."

Elegance!

VIP Integrated Library is a product with finesse, inside and out. Inside is one awesome but very elegant program. On the outside, it comes handsomely bound in two cloth covered, gold embossed binders with slipcases - like those you get with software for the Tandy 2000™. And remember, to get software of this quality for the Tandy 2000 you would have to pay hundreds more!

Buy the
Integrated Library for

$149.95

Or buy the individual volumes separately, as shown on the following pages!†

Stand-Alone Power

VIP Integrated Library is not one of those slip-shod, all-in-one slicer-dicer machines, good for one day and then you throw it away. It fully integrates the six top-of-the-line stand-alone programs described in the following pages: VIP Writer, VIP Speller, VIP Calc, VIP Database, VIP Terminal & VIP Disk-ZAP. You can buy the entire Integrated Library at once, or you can buy one or two programs that you need now and upgrade to the integrated Library later.†

Shared Files, Shared Features

All VIP Integrated Library applications share common features, such as ease of use, built-in help, the same commands, full printer control, full use of your 64K of memory, and step-by-step tutorials. Most important, all essential applications feature professional high resolution lowercase displays to give you a choice of 51, 64, or 85 characters per line, with 21 or 24 lines per screen. You get a professional display on your Color Computer without any hardware modification!

Requires 64K and one or more disk drives.
VIP Integrated Library comes on one disk. Tape versions of programs are not supplied.

†Those already owning one VIP product, except for VIP Speller, may purchase the Integrated Library by sending in the VIP program with a check or money order for $99.95. This upgrade offer is limited to one Library per person; credit will ONLY be given for one VIP program, regardless of how many are owned. This upgrade offer is available ONLY through Softlaw, and not through Radio Shack stores or dealers. **Include $6 for shipping & handling.**

VIP Writer™

Includes VIP Speller at no additional cost!!

By Tim Nelson

RATED TOPS IN RAINBOW
COLOR COMPUTER MAGAZINE & COMPUTER USER

The most powerful and easy-to-use word processor is available in the showpiece and workhorse of the **Library: The VIP Writer™**.

The result of two years of research, the **VIP Writer™** offer every feature you could desire from a word processor. It is the most powerful, fastest, most dependable and most versatile. With the hi-res display, workspace and compatibility features built into the **Library** the **Writer** is also the most usable.

". . . Nearly every feature and option possible to implement on the Color Computer. The design of the program is excellent; the programming is flawless." October 1983 "Rainbow"

"Among word processors for the CoCo, VIP Writer stands alone as the most versatile, most professional program available." May 1984 "Computer User"

The **Writer** will work with you and your printer to do things you always wanted to do. Every feature of your printer can be put to use, every character set, every graphics capability at any baud rate, EVEN PROPORTIONAL SPACING. All this with simplicity and elegance. You can even automatically print multiple copies.

Although all versions feature tape save and load, the disk version provides the Mini Disk Operating System common to the whole **Library**, plus disk file linking for continuous printing.

Professional features of particular note:

- Memory-Sense with **BANK SWITCHING** to fully utilize 64K, giving not just 24 or 30K, but up to 53K of workspace with the tape version and 50K with the disk version.
- TRUE FORMAT WINDOW allowing you to preview the printed page ON THE SCREEN BEFORE PRINTING, showing centered lines, headers, FOOTNOTES, page breaks, page numbers, & margins in line lengths of up to 240 characters. It makes HYPHENATION a snap.
- A TRUE EDITING WINDOW in all 9 display modes for those extra wide reports and graphs (up to 240 columns!).
- FREEDOM to imbed any number of PRINTER CONTROL CODES anywhere, **EVEN WITHIN JUSTIFIED TEXT**.
- Full 4-way cursor control, sophisticated edit commands, the ability to edit any BASIC program or ASCII textfile, SEVEN DELETE FUNCTIONS, LINE INSERT, LOCATE AND CHANGE, wild card locate, up to TEN SIMULTANEOUS block manipulations, word wrap around, programmable tabs, display memory used and left, non-breakable space, and headers, footers and FOOTNOTES.
- Automatic justification, automatic pagination, automatic centering, automatic flush right, underlining, superscripts, subscripts, pause print, single-sheet pause, and print comments.
- Type-ahead, typamatic key repeat and key beep for the pros, ERROR DETECTION and UNDO MISTAKE features, 3 PROGRAMMABLE functions, auto column creation, and instant on-screen HELP.

Radio Shack Catalog No. 90-0141
32K (Comes with tape & disk) $69.95
VIP Writer — VIP Speller Combo comes in VIP Writer Binder.

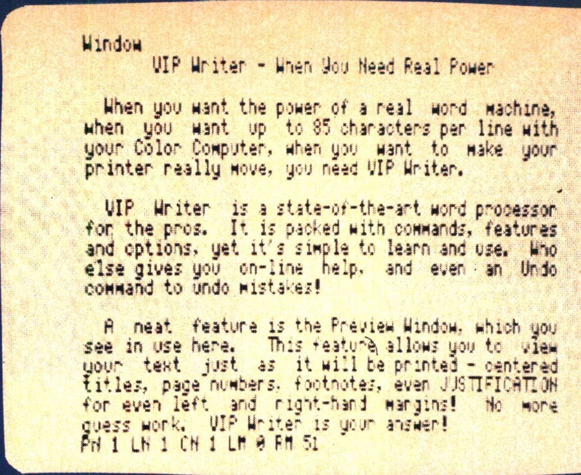
VIP Speller™

WITH A 50,000 WORD INDEXED DICTIONARY!

By Bill Argyros

Gone are the eyestrain, boredom and fatigue from endless proofreading. **VIP Speller™** is the fastest and most user-friendly speller for your CoCo. It can be used to correct any ASCII file — including **VIP Library™** files and files from **Scripsit™** and **Telewriter™**. It automatically checks files for words to be corrected, marked for special attention or even added to the dictionary. You can even view the word in context, with upper and lowercase. **VIP Speller™** comes with a specially edited 50,000 word dictionary which, unlike other spellers for the CoCo, is indexed for the greatest speed. The shorter your file, the quicker the checking time. And words can be added to or deleted from the dictionary or you can create one of your own. **VIP Speller™** also comes with the **Library's** mini disk operating system.

Radio Shack Catalog No. 90-0142
32K DISK ONLY $49.95
Hi-Res Lowercase displays not available on this program.



```
Window
      VIP Writer - When You Need Real Power

  When you want the power of a real  word  machine,
when  you  want  up  to 85 characters per line with
your Color Computer, when you  want  to  make  your
printer really move, you need VIP Writer.

  VIP  Writer  is a state-of-the-art word processor
for the pros.  It is packed with commands, features
and options, yet it's simple to learn and use.  Who
else gives you  on-line  help,  and  even  an  Undo
command to undo mistakes!

  A  neat  feature is the Preview Window, which you
see in use here.   This feature allows you to  view
your  text  just  as  it will be printed - centered
titles, page numbers, footnotes, even JUSTIFICATION
for even left  and  right-hand  margins!   No  more
guess work.  VIP Writer is your answer!
PN 1 LN 1 CN 1 LM 0 RM 51
```

VIP Calc™

By Kevin Herrboldt

You can forget the other toy calcs — The real thing is here! No other spreadsheet for the Color Computer gives you:

- **20 ROWS BY 9 COLUMNS ON THE SCREEN AT ONCE**
- **LOWERCASE LETTERS WITH DESCENDERS**
- **UP TO 16 CONCURRENT DISPLAY WINDOWS**
- **FLOATING-POINT MATH**
- **CHOICE OF SINGLE AND DOUBLE PRECISION**
- **WORKS WITH BASE 2, 10, AND 16 NUMBERS**
- **UP TO 512 COLUMNS BY 1024 ROWS**
- **USER DEFINABLE WORKSHEET SIZE FOR MORE MEMORY**
- **LOCATE FUNCTION TO FIND CHECK NUMBERS, NAMES, ETC.**
- **COLUMN/ROW MULTIPLE SORTS**
- **PROGRAMMABLE FUNCTIONS**
- **IMBEDDABLE PRINTER CONTROL CODES**
- **21 ALTERABLE PRINT FORMAT PARAMETERS**
- **ON-LINE HELP TABLES**
- **DOES NOT REQUIRE FLEX OR BASIC**

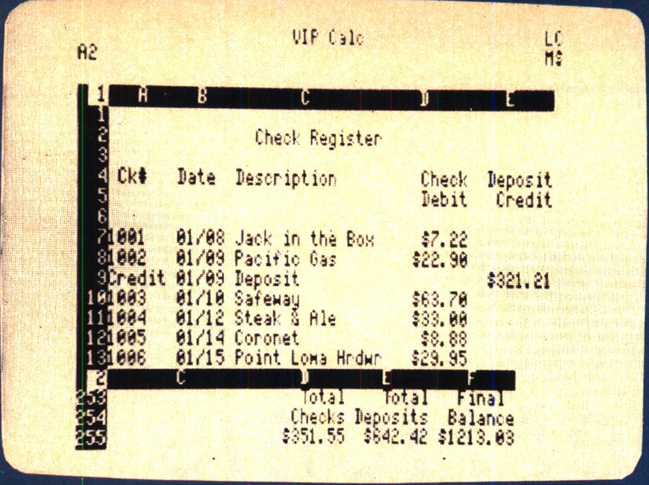
VIP Calc™ is truly the finest and easily the most powerful electronic worksheet and financial modeling program available for the Color Computer. Now every Color Computer owner has access to a calculating and planning tool better than VisiCalc™, containing all its features and commands and then some, WITH USABLE DISPLAYS. Use Visicalc templates with **VIP Calc™**!

There's nothing left out of **VIP Calc™**. Every feature you've come to rely on with VisiCalc™ is there, and then some. You get up to **5 TIMES** the screen display area of other spreadsheets for the Color Computer and Memory-Sense with **BANK SWITCHING** to give not just 24, or 30, but **UP TO 33K OF WORKSPACE IN 64K!!!** This display and memory allow you the FULL SIZE, USABLE WORKSHEETS you require. You also get: User definable worksheet size, up to 512 columns by 1024 rows! * Up to **SIXTEEN VIDEO DISPLAY WINDOWS** to compare and contrast results of changes * **16 DIGIT PRECISION** * Sine, Cosine and other trigonometric functions, Averaging, Exponents, Algebraic functions, and **BASE 2, 8, 10 or 16** entry * Column and Row, Ascending and Descending **SORTS** for comparison of results * **LOCATE FORMULAS OR TITLES IN CELLS** * Easy entry, replication and block moving of frames * Global or Local column width control up to 78 characters width per cell * Create titles of up to 255 characters per cell * Limitless programmable functions * Typamatic Key Repeat * Key Beep * Typeahead * Print up to 255 column worksheet * Prints at any baud rate from 110 to 9600 * Print formats savable along with worksheet * Enter PRINTER CONTROL CODES for customized printing with letter quality or dot matrix printer * Combine spreadsheet tables with **VIP Writer™** documents to create ledgers, projections, statistical and financial reports and budgets. Both versions feature Tape save and load, but the disk version also has the Mini Disk Operating System of the entire **Library**.

Radio Shack Catalog No. 90-0143

32K (Comes with tape & disk) $69.95

32K does not have hi-res displays, sort or edit.



```
                    VIP Calc                    LC
A2                                              M$

 1   A    B         C           D       E
 1
 2            Check Register
 3
 4 Ck#   Date  Description        Check  Deposit
 5                                Debit   Credit
 6
 71001   01/08 Jack in the Box    $7.22
 81002   01/09 Pacific Gas       $22.90
 9Credit 01/09 Deposit                   $321.21
101003   01/10 Safeway           $63.70
111004   01/12 Steak & Ale       $33.00
121005   01/14 Coronet            $8.88
131006   01/15 Point Loma Hrdwr  $29.95
 2          C         D       E      F
253                 Total    Total   Final
254                Checks Deposits  Balance
255               $351.55  $642.42 $1213.03
```

VIP Terminal™

RATED BEST IN JANUARY 1984 "RAINBOW"

By Dan Nelson

From your home or office you can join the communication revolution. The **VIP Terminal™** opens the world to you. You can monitor your investments with the Dow Jones Information Service, or broaden your horizons with The Source of CompuServe, bulletin boards, other computers, even the mainframe at work.

For your important communication needs you've got to go beyond software that only lets you chat. You need a smart termnal so that you can send and receive programs, messages, even other **VIP Library™** files. **VIP Terminal™** has "more features than communications software for CP/M, IBM and CP/M 86 computers." Herb Friedman, Radio Electronics, February 1984.

FEATURES: Choice of 8 hi-res lowercase displays * Memory-Sense with BANK SWITCHING for full use of workspace * Selectively print data at baud rates from 110 to 9600 * Full 128 character ASCII keyboard * Automatic graphic mode * Word mode (word wrap) for unbroken words * Send and receive **Library** files, Machine Language & BASIC programs. Duplex: Half/Full/Echo, Word length: 7 or 8, Parity: Odd/Even or None, Stop Bits: 1-9 * Local linefeeds to screen * Save and load ASCII files, Machine Code & BASIC programs * Lowercase masking * 10 Keystroke Multiplier (MACRO) buffers to perform repetitive pre-entry log-on tasks and send short messages * Programmable prompt or delay for send next line * Selectable character trapping * Send up to ten short messages (KSMs), each up to 255 characters long, automatically, to save money when calling long distance.

All versions allow tape load and save of files and KSMs, but the disk version also has the Mini Disk Operating System.

Radio Shack Catalog No. 90-0139
32K (Comes with tape & disk) $49.95
(Tape works in 16K but without hi-res displays)

Available By Express Order At Your Local Radio Shack® Store!

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VIP Database™

"ONE OF THE BEST" JULY 1984 "RAINBOW"

By Tim Nelson

This high speed MACHINE LANGUAGE program fills all your information management needs, be they for your business or home. And it does so better than any other database program for the Color Computer, featuring machine code, lowercase screens and mailmerge capabilities. Inventory, accounts, mailing lists, family histories, you name it, the **VIP Database™** will keep track of all your data, and it will merge **VIP Writer™** files.

The **VIP Database™** features the **Library** Memory Sense with BANK SWITCHING and selectable lowercase displays for maximum utility. It will handle as many records as fit on your disk or disks. It is structured in a simple and easy to understand menu system with full prompting for easy operation. Your data is stored in records of your own design. All files are fully indexed for speed and efficiency. Full sort of records is provided for easy listing of names, figures, addresses, etc., in ascending or descending alphabetic or numeric order. Records can be searched for specific entries, using multiple search criteria. With database form merge you may also combine files, sort and print mailing lists, print "boiler plate" documents, address envelopes - the list is endless. The math package even performs arithmetic operations and updates other fields. Create files compatible with the **VIP Writer™** and **VIP Terminal™**. Unlimited print format and report generation with the ability to imbed control codes for use with all printers.

As with all other **Library** programs, the **Database** features the powerful Mini Disk Operating System.

Radio Shack Catalog No. 90-0140
32K DISK $59.95
64K Required for math package & mail merge

VIP Disk-ZAP™

RAVED ABOUT IN THE APRIL 1983 "RAINBOW!"

By Tim Nelson

Your database file disk, form letter disk, or BASIC program disk goes bad. An I/O error stops loading, or even backing up of the disk. Weeks, even months of work sit on the disk, irretrievable. Now catastrophic disk errors are repairable, quickly and with confidence, using the **VIP Disk-ZAP™**. It is the ultimate repair utility for simple and quick repair of all disk errors. Designed with the non-programmer in mind, the **VIP Disk-ZAP™** will let you retrieve all types of bashed files, BASIC and Machine Code programs.

This high-speed machine code disk utility has a special dual cursor screen display to look at the data on your disk. You are able to: Verify or modify disk sectors at will * Type right onto the disk to change unwanted program names or prompts * Send sector contents to the printer * Search the entire disk for any grouping of characters * Copy sectors * Backup tracks or entire disks * Repair directory tracks and smashed disks * Full prompting to help you every step of the way * 50-plus page Operators Manual which teaches disk structure and repair.

Radio Shack Catalog No. 90-0144
16K DISK $49.95
Hi-Res Lowercase displays not available with this program.

VISA To Order Direct Call: MasterCard

1-800-328-2737

All Order Status and Software Questions must call (805) 968-4364
MAIL ORDERS: $3.00 U.S. Shipping per product (VIP Library is two products) **$6.00** CANADA; **$20.00** OVERSEAS. Personal checks allow 4 weeks. All prices subject to change without notice.

Softlaw

132 Aero Camino
Goleta,
California 93117

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All prices subject to change without notice.

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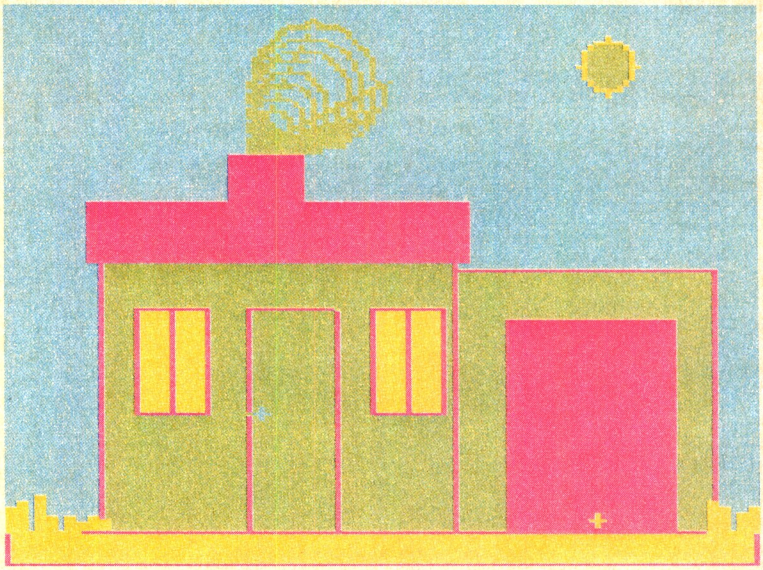
Home Sweet Home

By Marlene Fearing

This program draws a house, a sun and a garage. It opens and closes the garage door, the front door opens and a figure appears and waves. Afterward, the door closes, the grass grows, and smoke comes from the chimney.

This is the first computer program I wrote after getting my computer. I hope it will encourage others to experiment with graphics and animation; it was a lot of fun to create. This program will work with 16K Extended BASIC with tape, or with a disk drive system. Just type it in and watch it draw.

(Marlene Fearing is a student at Pima Community College in Tucson, Ariz., where she is studying for her A.A.S. as a small business computer specialist.)



25	54
52	1
90	230
END	241

The listing:

```
1 '
2 '*****************************
3 '*                           *
4 '*    EXECUTIVE HOUSE        *
5 '*    MARLENE FEARING        *
6 '*    812 S. PLUMER          *
7 '*    TUCSON, ARIZ. 85719    *
8 '*                           *
9 '*****************************
10 PMODE 3,1
11 PCLS (3)
12 SCREEN 1,1
13 '   DRAW MAIN HOUSE
14 LINE (32,180)-(152,88),PSET,B
15 LINE (28,68)-(156,88),PSET,BF
16 PAINT (32,72),2,4
17 LINE (152,91)-(240,180),PSET,
B
18 LINE (170,108)-(226,180),PSET
,B
19 '        DRAW THE SUN
20 CIRCLE (204,22),10,2
21 LINE (44,104)-(68,140),PSET,B
22 LINE (124,104)-(148,140),PSET
,B
```

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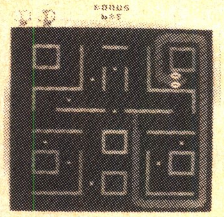
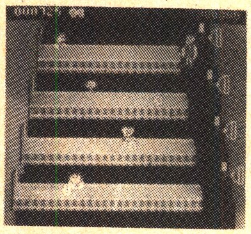


BUZZWORM

This one will drive you nuts. Guide the snake around the screen eating the snakebait for points; but don't bite yourself! Lots of fun awaits you with this one.

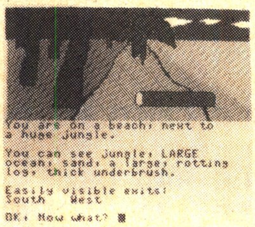
REQUIRES 32K & JOYSTICK
TAPE $15.95
DISK $18.95



BREWMASTER

Move along the end of the bars serving beer to your thirsty customers. Watch for falling glasses and rowdy customers. Loads of fun.

REQUIRES 32K & JOYSTICK
TAPE $14.95
DISK $17.95



```
You are on a beach; next to
a huge Jungle.

You can see Jungle; LARGE
ocean; sand; a large; rotting
log; thick underbrush.

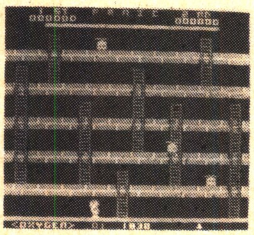
Easily visible exits:
South   West

OK, Now what? █
```

BLACKBEARD'S ISLAND

A brand new high res graphic adventure. This one will blow your socks off! Wander around Blackbeard's Island being ever mindful of the hazards while your lust builds for Blackbeard's buried treasure. T'aint easy, matey!

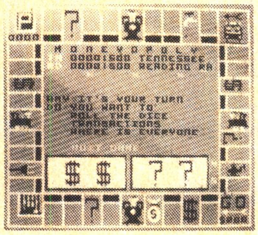
REQUIRES 32K DISK ONLY
DISK $19.95



PANIC

Climb the ladders and fight the "meanies". Dig holes and bury them. Hours of fun await you in this outstanding graphic arcade game. Enjoyment for all ages.

REQUIRES 32K & JOYSTICK
TAPE $14.95
DISK $17.95



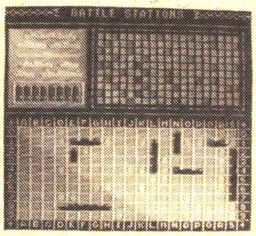
```
M O N E Y O P O L Y
0000:500 TENNESSEE
0000:500 READING RR

... IT'S YOUR TURN
DO YOU WANT TO
  ROLL THE DICE
  TRANSACTIONS
  WHERE IS EVERYONE
```

MONEYOPOLY

Now! Play this popular board game on your computer. Probably the most realistic computer board game simulation ever. Contains all the features of the original. Buy, rent or sell properties and become a wealthy land baron with this program.

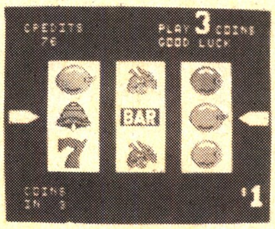
REQUIRES 32K & JOYSTICK
TAPE $19.95
DISK $22.95



BATTLE STATIONS

BATTLE STATIONS is a remake of a popular board game. Without a doubt the most outstanding sound and graphics you have ever heard or seen. **BATTLE STATIONS** is a one player interactive simulation of skill, strategy and luck. The player pits his tactical skills against the cold, cunning logic of the computer.

REQUIRES 32K DISK
TAPE $21.95
DISK $24.95

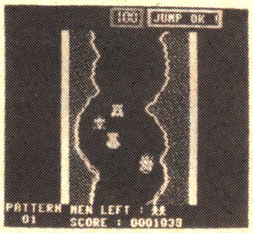


VEGAS GAME PAK

Have you ever wanted to bring Las Vegas home with you? Now you can! Six different games in this package: Blackjack, Keno, Poker, plus three slot machine lookalikes. You'll swear you are at the table or the slots when you see the outstanding graphics we have created.

REQUIRES 32K
TAPE $24.95
DISK $27.95

6 games



COLOR CAR

You asked for it and now here it is! Fast-moving Grand Prix style racing. With your computer sit at the wheel of your racer through the difficult racecourse. Smash into other cars but be careful because they'll return the favor. Jump your car through the air, over water, and other hazards.

REQUIRES 64K & JOYSTICK
TAPE $19.95
DISK $22.95

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```
23 LINE (82,104)-(112,180),PSET,
B
24 LINE (76,52)-(100,68),PSET,BF
25 CIRCLE (84,140),2,2
26 PAINT (44,160),1,4
27 PAINT (169,176),1,4
28 CIRCLE (200,176),3,2
29 PAINT (204,22),1,2
30 PAINT(56,120),2,4:PAINT (133,
120),2,4
31 LINE (56,104)-(56,140),PSET
32 LINE (136,104)-(136,140),PSET
33 '        TO OPEN AND CLOSE GAR
AGE DOOR
34 FOR X=1 TO 500:NEXT X
35 PAINT (190,179),2,4
36 FOR X=1 TO 1500:NEXT X
37 PAINT (176,110),4,4
38 CIRCLE (200,176),3,2
39 LINE (0,180)-(255,191),PSET,B
40 '       TO OPEN AND CLOSE FRONT
 DOOR AND FIGURE TO WAVE AND GO
BACK INSIDE
41 LINE (92,112)-(92,190),PSET
42 LINE (92,190)-(112,180),PSET
43 PAINT (185,190),1,4
44 PAINT (10,185),2,4
45 LINE (92,112)-(112,104),PRESE
T
46 PAINT (185,190),2,4
47 LINE (92,112)-(92,190),PRESET
48 LINE (92,190)-(112,180),PRESE
T
49 LINE (0,255)-(255,180),PSET,B
50 FOR X=1 TO 120:NEXT X
51 LINE (102,112)-(112,104),PSET
52 LINE (102,112)-(102,190),PSET
53 LINE (102,190)-(112,180),PSET
54 PAINT (96,124),1,4
55 CIRCLE (96,124),7,0
56 LINE (96,130)-(96,164),PSET
57 LINE (96,164)-(84,179),PSET
58 LINE (96,140)-(84,140),PSET
59 LINE (96,164)-(102,179),PSET
60 LINE (96,140)-(102,140),PSET
61 LINE (86,140)-(86,130),PSET
62 FOR X=1 TO 300:NEXT X
63 LINE (86,140)-(86,120),PRESET
64 FOR X=1 TO 500:NEXT X
65 LINE (86,140)-(86,130),PSET
66 FOR X=1 TO 150:NEXT X
67 LINE (86,140)-(86,130),PRESET
68 FOR X=1 TO 150:NEXT X
69 LINE (86,140)-(86,130),PSET
70 CIRCLE (96,124),7,1
71 LINE (96,130)-(96,164),PRESET
72 LINE (96,164)-(84,179),PRESET
73 LINE(96,140)-(84,140),PRESET
74 LINE (0,180)-(255,180),PSET
75 LINE (96,164)-(102,179),PRESE
T
76 LINE (96,140)-(102,140),PRESE
T
77 LINE (86,140)-(86,130),PRESET
78 LINE (102,112)-(112,104),PRES
ET
79 LINE (102,112)-(102,190),PRES
ET
80 LINE (102,190)-(112,180),PRES
ET
81 LINE (0,180)-(255,191),PSET,B
82 CIRCLE (86,140),3,3
83 COLOR 2,1
84 PAINT (30,188),2,4
85 PAINT (232,188),2,4
86 '
87 '    TO DRAW GRASS
88 '
89 POKE 65495,0
90 DRAW "BM0,180;R1;U8;R2;D8;R2;
U10;R2;D10;R3;U12;R2;D12;R3;U5;R
2;D5;R3;U5;R2;D5;R2;U3;R2;D2;R2;
U4;R2;D4;R2;U3;R2;D3"
91 DRAW "BM238,180;U10;R2;D10;R3
;U8;R2;D8;R4;U6;R2;D6;R2;U8;R2;D
8;R1"
92 '
93 'SMOKE STARTS HERE
94 '
95 X=82:Y=52: 'CIRCLE CENTERPOIN
T
96 SP=0:EP=0  'CIRCLE RADIUS
97 FOR R=1 TO 35 STEP .05  'CIRC
LE RADIUS
98 EP=EP+.02: IF EP>1 THEN EP=0
99 CIRCLE (X+R,Y-R),R,1,1,SP,EP
100 NEXT R
101 '
102 '        TO TURN BACKGROUND TO
 NIGHT
103 '
104 PMODE 4,1
105 SCREEN 1,0
106 CIRCLE (204,22),10,5
107 PAINT (208,22),5.5
108 '        REDRAWN SMOKE STARTS
 HERE
109 X=82:Y=52:  'CIRCLE CENTERPO
INT
110 SP=0:EP=0:  'CIRCLE RADUIS
111 FOR R=1 TO 35 STEP.05 'CIRCL
E RADUIS
112 EP=EP+.02:IF EP>1 THEN EP=0
113 CIRCLE (X+R,Y-R),R,1,1,SP,EP
114 NEXT R
115 POKE 65494,0
116 GOTO 10
117 END
```

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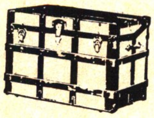

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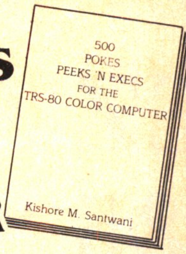

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EZ-Graphics — '85 Style

By Fred B. Scerbo
Rainbow Contributing Editor

Editor's Note: If you have an idea for the Wishing Well, submit it to Fred c/o THE RAINBOW. *Remember, keep your ideas specific, but don't forget that this is* BASIC. *All programs resulting from your wishes are for your use but remain the property of the author.*

Each of us often spends a great deal of time making New Year's resolutions which are quite often forgotten within several days of the pledge. Although I have some resolutions which I will try to work into my daily routine, one resolution which I really wanted to make was a pledge to those of you who still have only 16K Extended Color BASIC and have been left along the roadside during our last few "Wishing Well" articles. (The last three have all been for 32K.) While this does not mean that you won't be seeing the most requested sequels, such as "Rockfest II" and "Baseball Fever II," I figured that this would be a good time to offer all of you some shorter listings that will equally satisfy everyone from 16K to 64K. This will be a great relief to all of you who will want to key these listings in but may be too pressed to hammer in the really long ones during the hectic rush of the holiday season. Also, some of you may have just gotten a CoCo for the first time during the holiday season and odds are that more of you got 16K than 64K.

So, as a little New Year's gift for all of you CoCo enthusiasts, here are two short listings which I dare any friends you may have to equal in as few lines on an Apple II or Commodore 64. These are strictly for the fun of creating sharp graphics. Next month we will get back to some more serious wishes.

(Fred Scerbo is a special needs instructor for the North Adams Public Schools. He holds a master's in education and published some of the first software available for the Color Computer through his software firm, Illustrated Memory Banks.)

Who You Gonna Call?

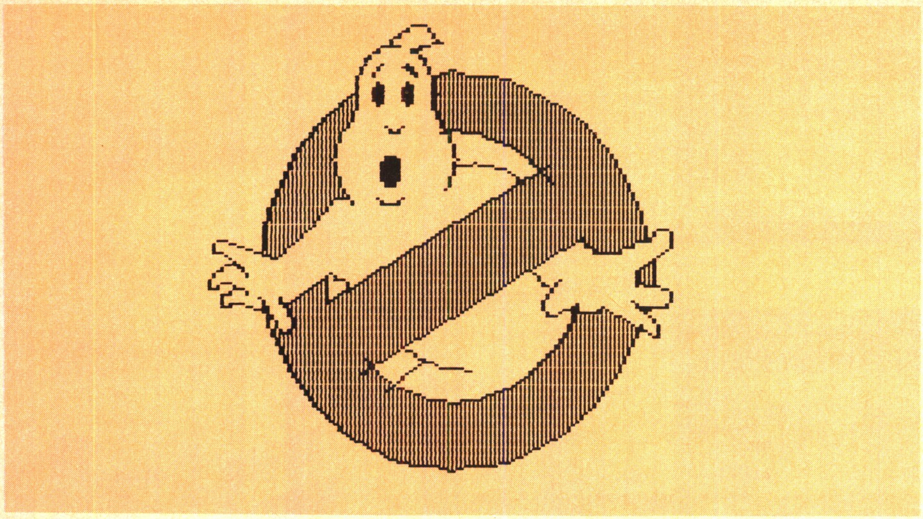
Probably one of the most successful motion pictures of the past summer movie season was the comedy, *Ghostbusters.* Besides being a funny movie, this cinematic effort has as one of its offsprings a symbol which is quickly becoming as common as "Rubik's Cube," Michael Jackson and "Cabbage Patch" dolls. Recently, I have seen this particularly catchy no-ghosts logo showing up on everything from T-shirts to bumper stickers. Well, here's one more place you can look to see this omnipresent poltergeist: on the screen of your CoCo.

Why even do this? Well, as I have said before, young CoCo programmers often take great pride in being able, with just a few program lines, to create graphics which are easily recognized. This eventually will serve to stimulate even the most inexperienced programmer to learn more, and eventually create a program which others can benefit from as well.

Therefore, Listing 1 is an extremely short program which will recreate the *Ghostbusters* logo in rather dramatic detail before your eyes. The actual body of the listing which draws the ghost and the slashed circle is only about 13 lines long. As I just mentioned, I doubt any Apple or Commodore programmers will be able to match this graphic on their machine in as few lines. This just gives you one more weapon to use in convincing others that you made the best choice when you chose a Color Computer.

The actual graphic uses *PMODE 4* with an overlay of *PMODE 3* (without using the *SCREEN* command). The ghost and slash are formed by a combination of semi-circle and *DRAW* commands, accounting for how efficiently this BASIC code can be written. You would need a little trigonometry to get similar results on the other computers.

One difference you will notice this time around is that I have used the Reset button to control the occurrence of red. When you *RUN* the program, if the screen is not red, press Reset and *reRUN* the program until it is red. Once it is red, press the ENTER key to draw the graphics. Most of my other programs usually offset a pixel to control the colors without using Reset, but since this was such a short listing, I figured



that the Reset was the quickest route to follow.

A final word should be mentioned here before we move on to our second listing. The actual *Ghostbusters* symbol is the property of Paramount Pictures which holds all rights for its commercial use. Therefore, this listing is for your own personal home use for the fun of it, and may not be used for any promotional purposes. (For example, if any of you were thinking of writing your own *Ghostbusters* game, you could not use this graphics or the logo as part of your effort.) However, no harm should come from using this listing for the fun of learning more about how your CoCo's graphics commands work. Consider it an educational experience.

Therefore, enjoy this little graphics gem, and let me know if you have any ideas for other similar efforts I might be able to share in the "Well."

Sharing The Wealth (Of Graphics Skills)

In the last two installments of "The Wishing Well," I shared with you a technique of using checkerboard pixel patterns to create extra colors in *PMODE4* (and *PMODE3* as well). We saved these patterns in GET-PUT arrays, and painted them on the screen using the *OR* command found with *PUT*. Using this technique, any area which has previously been painted black will be filled in with the color found in our array. For a more detailed explanation of how these colors are generated, refer to last month's article.

There was one small drawback with the method used in last month's issue. While the technique was completely effective for what we wanted to accomplish with those football helmet graphics, the routines were not designed for you to easily use if you wanted to use the extra colors in your own drawings. As I promised, I have come up with a way that you could use them easily without having to do a great deal of graphics gymnastics. The method I have listed here will be a piece of cake to anyone who knows how to use the *LINE* command found in your Color Extended language.

Another limitation found in last month's version was the fact that the array covered nearly the full width of the screen. This would mean that your graphics would have to be drawn and colored in a fashion that would not allow you to have a yellow object next to a purple object, since the arrays would overlap each other on the same level. Therefore, these new routines have set up arrays which are only 16 pixels wide and two pixels deep. This allows greater flexibility in this type of painting when more than one color is desired on the same left to right level. It also takes up less than 10 percent of the memory required to do it the original way. The routines used for "Football 1 and 2" are much faster than this technique. Since speed was more important than flexibility, those were written with speed in mind. As always, you have the classic trade-off. Speed and flexibility are inversely proportional. This month we will emphasize flexibility instead, while sacrificing speed.

Therefore, the BASIC code required to efficiently and easily use these colors has been written to be part of the first 25 lines of your program. If you wish to draw graphics using them, you would simply start your own program lines at Line 100. There is a special syntax which I have developed to handle the colors which I will explain in just a few lines. Simply put, it is a new way of coloring, but at the same time will be very familiar to you.

Actually, the most difficult part of writing this program was thinking of what to draw as a graphics to demonstrate the routines. I didn't want to do a rock logo because those will be showing up in a couple of months, and there was no reason to let the wind out of my sails for that one yet. Secondly, the colors would be of no use for the *Ghostbusters* graphics listed here. Besides, that would make it longer, defeating the whole purpose of doing the logo in the first place.

When the idea for what to draw finally came to me, I wanted to kick myself for not having thought of it in the first place. What is one of the first paintings or drawings that an aspiring young artist starts with? Why, of course, the answer was a bowl of fruit! Sure, it may not be as dramatic as the car from the ZZ Top logo of a few months ago, but it would give me the possibility of drawing and using more than one of these colors side by side.

With this in mind, I developed a set of seven additional color patterns to be included in the arrays. These patterns are set in lines 11-14 and put into the arrays in Line 15. The colors and their corresponding Syntax letters are listed below. Remember, the actual color may depend on how accurately your TV set tint is adjusted to red and blue.

Y = Yellow
B = Light blue
G = Gold or orange
S = Silver or gray
P = Purple (dark)
L = Lime or dark blue
V = Violet

The lime color is not really so much of a green, but depending on your tint, it is about as close as we can get. You will notice that I mentioned that the letters are part of the syntax. You will actually use these letters to call the colors as you need them.

Remember how I mentioned that the syntax would be familiar to anyone who knew how to use the *LINE* command ? As you may recall, the syntax for *LINE* is:

```
LINE (x1,y1)—(x2,y2),PSET
```

The variables x1,x2,y1 and y2 are used to define the starting and end points of a line (or box) using x and y coordinates on a field of 256x192 pixels. Therefore, if you wanted to draw a box with opposite coordinates of 10,10 by 20,20 you would write:

```
LINE(10,10)—(20,20),PRESET,BF
```

which would give you a box 10 pixels square painted in black (because of BF which means box filled). To paint this box with our new colors, you would use the same coordinates. These coordinates are placed in a STRING I call PAINT STRING which is identified as PT$ in these routines. The syntax for

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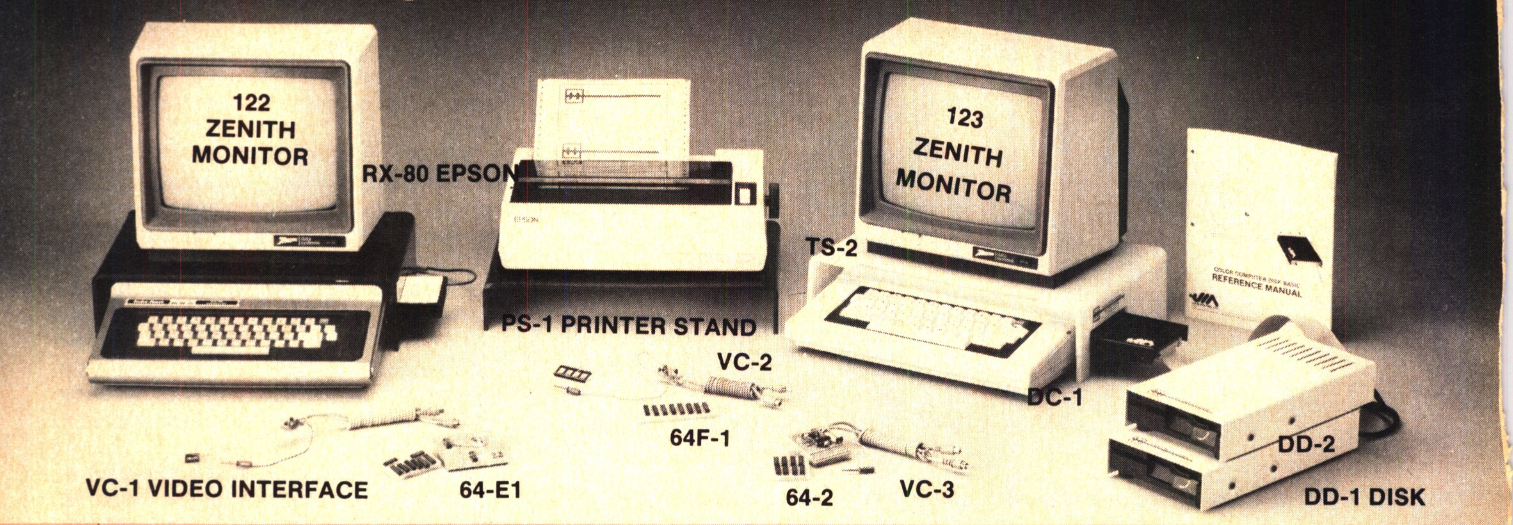

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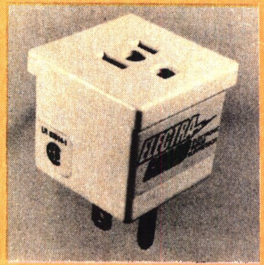

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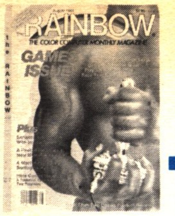

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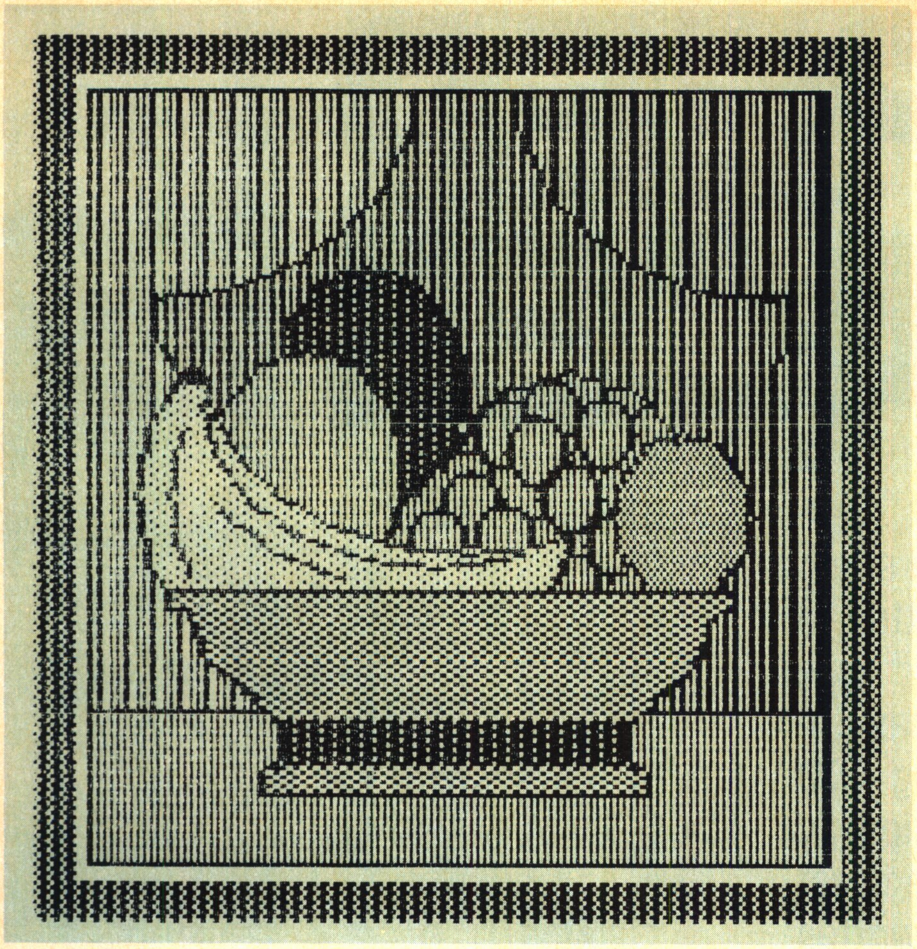

these coordinates would thus be:

```
PT$=“Y010,010—020,020”
```

The Y stands for the color yellow. The next three digits are the coordinate for our x1 coordinate followed by a comma, with the next three digits being the y1 coordinate. We then use a dash and use three digits for x2, a comma, and three digits for y2. The coordinates for a box such as:

```
LINE(10,20)—(30,40),PSET,BF
```

would be:

```
PT$=“Y010,020—030,040”
```

In each case, we use this PAINT STRING by following it with the following command:

```
GOSUB 17
```

which takes care of the painting. You will notice that even though the numbers we are using are only two digit numbers, we must use three digits such as 010 for 10, or 006 for the number 6. This is necessary because the PAINT STRING is analyzed in lines 17 and 18 to determine the coordinates and colors. This was much easier than to have you type in the values for five separate variables. If you accidentally use two digits rather than three, the painting will not take place. There will not be an error message. There will just be no painting. Thus, our syntax for PAINT STRING is:

```
PT$=“Color,Left Corner,Top
Corner—Right Corner,Bottom
Corner”
```

followed by *GOSUB 17*. All corner coordinates must be three digits. As you can see, if you know how to use *LINE,* you will have no trouble using PAINT STRING.

If you *RUN* the second listing called *Seven More PMODE4 Colors*, you will have a very nice, framed painting of a bowl of fruit with drapes in the background. You will be pleased to see that this does make a very nice graphics to use for showing the colors available on your CoCo.

I did not use all seven colors here. Rather, I used just a few so you would get the idea. To get a nice curtain or draped effect, I used *POKE 178,x* to give a little added realism. Remember, the technique used for this is to use a value between zero and 255 with the *POKE* and the *PAINT* using:

```
PAINT(x,y),,1
```

to get your striped colors. This was described many months ago in THE RAINBOW.

Lines 310 to 380 are designed to let you change *PMODE*s and *SCREEN*s to see how these patterns look under different combinations. Hitting the ENTER key will flip through the various combinations. I have also used Reset to control red in this program. If the screen is not red when you *RUN* it, press Reset until it is and then hit ENTER to continue. Again, I felt that this would be preferable to my other method since the Reset route is very popular, and you might find it easier since you may want to use these routines yourself.

Let's say you have *RUN* this program and now want to use these colors for your own graphics. Load in the program and type:

```
DEL 110—
```

and hit ENTER. This will delete all following lines keeping the routines intact. It will also set your screen for *PMODE 4* with *PMODE3* colors. You may wish to alter Line 100 to suit you needs. Since I have already used a number of variables in the routines, you will want to take care not to use these same variables! Here is a list of the variables which you should avoid:

R,B,X,Y,G,S,P,L,V,LC,RC,TC, BC,YY,ZZ

and the string variables:
XX$ and PT$

The variables R and B stand for red and blue, and you may substitute them in the program to suit your needs. I have chosen instead to use the values of 3 and 2 in the program so as to not bury you in variables.

If you wish to use these routines, you may renumber them, but you must leave the *REM* statements intact since this program is under copyright. Feel free to create using these techniques, but remember to give credit where credit is due! That's what makes it possible to share these techniques with you.

Let's try a little experimenting so you can see how this really works. Delete the first lines as I mentioned and type in the following new lines:

```
110 CIRCLE(128,96),60,1,.9
120 PAINT(128,46),1,1
130 PT$=“Y068,042—190,150”:
GOSUB17
140 LINE(68,42)—(190,150)
,PRESET,B
```

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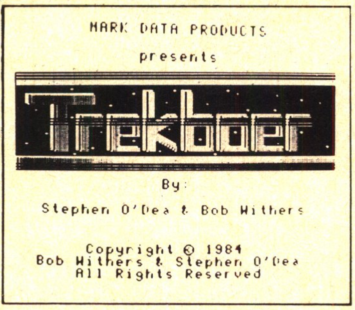

```
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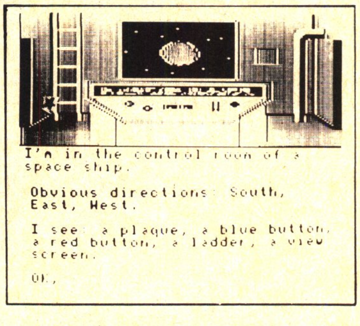

```
I'm in the control room of a
space ship.

Obvious directions: South,
East, West.

I see: a plaque, a blue button,
a red button, a ladder, a view
screen.

OK.
```

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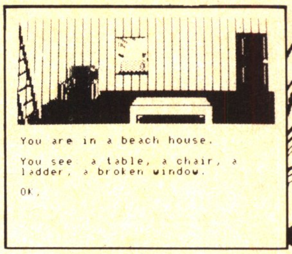

```
You are in a beach house.

You see: a table, a chair, a
ladder, a broken window.

OK.
```

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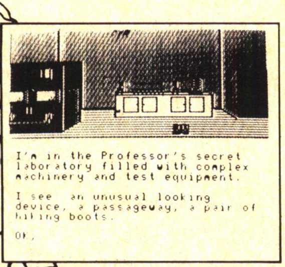

```
I'm in the Professor's secret
laboratory filled with complex
machinery and test equipment.

I see: an unusual looking
device, a passageway, a pair of
hiking boots.

OK.
```

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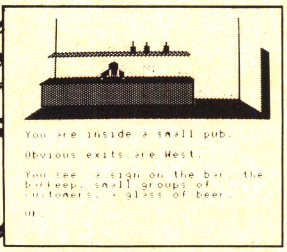

```
You are inside a small pub.

Obvious exits are West.

You see: a sign on the bar, the
barkeep, small groups of
customers, a glass of beer.

OK.
```

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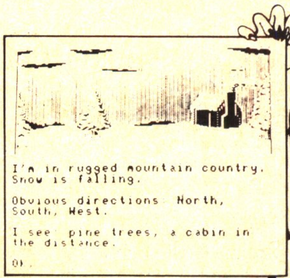

```
I'm in rugged mountain country.
Snow is falling.

Obvious directions: North,
South, West.

I see: pine trees, a cabin in
the distance.

OK.
```

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```
1000 GOTO1000
```

This will draw a circle, paint it black, PAINT STRING it yellow, and surround it with a box that shows the area actually covered by the array. Thus, if you have an irregular shaped object and paint it black, you can fill it in with these colors just as you would with PAINT because we are using *OR* which checks to see if a pixel is set, and if it is not, it sets it to the pattern. You may also need to redraw around the object since the color will fill in any area it overlaps, which is black.

Although these new smaller arrays do mean you can have adjacent colors, be careful not to make the items too close together, as I tried to be sure of with the fruit. With a little experimentation, you will be painting with ease in no time at all. (In fact, you will most likely be seeing the routines and variations on them in upcoming graphics wishes. I mean, why shouldn't I take advantage of this easier method as well?)

In playing with the sample I have just given you, change the letter for the color in Line 130. This will give you a better idea of how to control the colors. Probably the hardest thing to color this way would be concentric circles. If you can handle that one, you can handle most any graphics. Yes, it can be done, but I won't show you how now. Let's see you try it yourself.

Conclusion

When I think of the types of graphics people originally got excited about when Color Extended came to the CoCo, and I see how far we have come with the very same machine, I can only imagine that things will continue to get more exciting. I started with Color BASIC with a $499 16K machine and thought that block graphics were great back in 1981. Who would ever think we would be milking such detail out of this machine without really changing the original language? I'll keep searching for ways to make these things better. You just keep feeding me ideas.

Happy New Year and Happy Programming!

60....... 231
END 118

Listing 1:

```
1 '*****************************
2 '*      GHOSTBUSTERS LOGO     *
3 '*      BY FRED B. SCERBO     *
4 '* 149 BARBOUR ST.N.ADAMS.MA*
5 '*     COPYRIGHT (C)  1984    *
6 '* LOGO IS THE PROPERTY OF   *
7 '* OF PARAMOUNT PICTURES &   *
8 '* IS FOR YOUR HOME USE ONLY*
9 '*****************************
10 PMODE4,1:PCLS1:SCREEN1,1:PMOD
E3:R=3:PCLS3
20 IFINKEY$<>CHR$(13)THEN20
30 PCLS4
40 CIRCLE(100,40),20,1,.9,.46,.0
5:DRAW"C4BM100,24NU2R6DR2C1R4ER2
M+6,-1R2L3H6L6G2L2G2LG2DR3"
50 CIRCLE(100,62),30,1,.66,.41,.
63:CIRCLE(100,62),30,1,.66,.9,.1
:DRAW"BM-22,+24M+2,-4BR36M+2,+4F
2BM-16,-20F4M-6,-3R2BL12BUG4BD4B
RD4F2U8F2D5BR9BUNU4F2U8F2D5BD8BL
4G2L4H2BD12BL2D6F2U10R2D10R2U10F
2D6BD6BR2G2L8H2BL16BU2F4H2L6"
60 DRAW"M-12,+10M-16,+10M-24,-6L
4G2D2R4M+10,+6NF2H2L6G2L2G4D2R4E
2R4F2R4F2H2L4G2L4D4R4ER4M+10,+2R
4NH4M+6,+8R4E2U2M-6,-8D2R4M+20,-
10F2R4F2D"
70 CIRCLE(138,80),30,1,.6,.69,.9
:CIRCLE(136,112),42,1,.5,.25,.4
80 DRAW"BM114,130M-18,+10"
90 DRAW"BM166,100F4R2F2NE4G4D2F2
R4M+9,-3F2R9E2M+24,+10R2U4M-12,-
8M+3,+2R4NDR2NDR8E2U2H2M-14,-2ND
U4M+8,-4ND8M+8,-4U4H2L4G4L2NU4L4
G2L4G2L12H2L2H2"
100 CIRCLE(128,98),92,1,.85,.52,
.675:CIRCLE(128,98),92,1,.85,.74
,.98:CIRCLE(128,98),92,1,.85,.05
,.48
110 CIRCLE(128,98),62,1,.85,.74,
.9:CIRCLE(128,98),62,1,.85,.05,.
39
120 DRAW"BM68,110NU8M+104,-46BF2
0BD4BL4M-104,+46R2"
130 PAINT(78,36),R,1:PAINT(134,2
4),R,1:PAINT(218,100),R,1
140 PAINT(2,2),1,1:PAINT(134,50)
,1,1:PAINT(72,106),1,1:PAINT(92,
136),1,1
150 GOTO150
```

15....... 221
25........ 18
210...... 157
END 89

Listing 2:

```
1 '*****************************
2 '* SEVEN MORE PMODE4 COLORS *
3 '*      BY FRED B. SCERBO     *
4 '* 149 BARBOUR ST.N.ADAMS.MA*
5 '*     COPYRIGHT (C)  1984    *
6 '*****************************
7 CLEAR1000:R=3:B=2
8 PMODE4,1:PCLS1:SCREEN1,1:PMODE
3:PCLS3
9 IFINKEY$=CHR$(13)THEN11ELSE9
10 'START COLOR SET
11 CLS0:PMODE4,1:PCLS0:SCREEN0,0
:DIM Y(3),B(3),G(3),S(3),P(3),L(
3),V(3):LINE(32,0)-(48,5),PSET,B
F
12 FORX=31TO47STEP4:PSET(X,0,0):
PSET(X+2,1,0):PSET(X+1,4,0):PSET
(X+3,5,0):NEXT
13 FORX=32TO47STEP8:PSET(X,8):PS
```

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```
ET(X+4,9):LINE(X,12)-(X+1,12),PS
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NE(X+2,13)-(X+3,13),PSET:LINE(X+
6,13)-(X+7,13),PSET
14 PSET(X,16):PSET(X+1,17):PSET(
X+4,16):PSET(X+5,17):PSET(X+1,20
):PSET(X+5,21):NEXTX:PMODE3:COLO
R2,3:LINE(32,24)-(48,24),PSET:LI
NE(32,25)-(48,25),PRESET
15 PMODE4:GET(32,0)-(47,1),Y,G:G
ET(32,4)-(47,5),B,G:GET(32,8)-(4
7,9),G,G:GET(32,12)-(47,13),S,G:
GET(32,16)-(47,17),P,G:GET(32,20
)-(47,21),L,G:GET(32,24)-(47,25)
,V,G
16 GOTO100:'PAINTING ROUTINES
17 LC=VAL(MID$(PT$,2,3)):TC=VAL(
MID$(PT$,6,3)):RC=VAL(MID$(PT$,1
0,3)):BC=VAL(MID$(PT$,14,3))
18 XX$=LEFT$(PT$,1):IFXX$="Y"THE
N19ELSEIFXX$="B"THEN20ELSEIFXX$=
"G"THEN21ELSEIFXX$="S"THEN22ELSE
IFXX$="P"THEN23ELSEIFXX$="L"THEN
24ELSEIFXX$="V"THEN25ELSERETURN
19 FORYY=TC TO BC STEP2:FORZZ=LC
 TO RC STEP16:PUT(ZZ,YY)-(ZZ+15,
YY+1),Y,OR:NEXTZZ,YY:RETURN
20 FORYY=TC TO BC STEP2:FORZZ=LC
 TO RC STEP16:PUT(ZZ,YY)-(ZZ+15,
YY+1),B,OR:NEXTZZ,YY:RETURN
21 FORYY=TC TO BC STEP2:FORZZ=LC
 TO RC STEP16:PUT(ZZ,YY)-(ZZ+15,
YY+1),G,OR:NEXTZZ,YY:RETURN
22 FORYY=TC TO BC STEP2:FORZZ=LC
 TO RC STEP16:PUT(ZZ,YY)-(ZZ+15,
YY+1),S,OR:NEXTZZ,YY:RETURN
23 FORYY=TC TO BC STEP2:FORZZ=LC
 TO RC STEP16:PUT(ZZ,YY)-(ZZ+15,
YY+1),P,OR:NEXTZZ,YY:RETURN
24 FORYY=TC TO BC STEP2:FORZZ=LC
 TO RC STEP16:PUT(ZZ,YY)-(ZZ+15,
YY+1),L,OR:NEXTZZ,YY:RETURN
25 FORYY=TC TO BC STEP2:FORZZ=LC
 TO RC STEP16:PUT(ZZ,YY)-(ZZ+15,
YY+1),V,OR:NEXTZZ,YY:RETURN
90 'START YOUR PROGRAM HERE
100 PMODE4:PCLS1:SCREEN1,1:PMODE
3
110 PMODE4:COLOR0,0:LINE(0,0)-(2
54,192),PSET,B:LINE(12,8)-(243,1
83),PSET,B:PAINT(2,2),0,0:PMODE3
120 PT$="P000,000-255,008":GOSUB
17:PT$="P000,182-255,192":GOSUB1
7:PT$="P000,000-008,192":GOSUB17
:PT$="P240,000-252,192":GOSUB17
130 GOSUB140:GOTO150
140 DRAW"BM40,120C1ND4R170D4L4G4
D2G2D2G4L2G4L2G4L2G4D6F2R2F2D4L1
16U4E2R2E2U6H4L2H4L2H4L2H2L2H2U2
H2U2H4L4U4":RETURN
150 PAINT(50,122),1,1:PT$="S036,
120-210,146":GOSUB17:PT$="G062,1
48-214,156":GOSUB17:PT$="S048,15
8-210,170":GOSUB17:GOSUB140
160 GOSUB170:GOTO180
170 CIRCLE(60,100),30,1,1.1,.4,.
7:CIRCLE(130,72),80,1,.5,.2,.5:D
RAW"BM160,108C1D4G2D2G4":RETURN
180 PAINT(158,112),1,1:PT$="Y030
,076-160,118":GOSUB17:GOSUB170
190 CIRCLE(120,80),70,1,.5,.2,.5
:CIRCLE(114,72),80,1,.6,.3,.4:CI
RCLE(66,100),26,1,1.1,.4,.6
200 CIRCLE(100,76),30,1,.9:PAINT
(100,58),1,1:PT$="G069,048-120,0
98":GOSUB17:CIRCLE(100,76),30,1,
.9,.6,.2
210 CIRCLE(82,94),30,3,.9,.58,.1
:CIRCLE(130,72),80,3,.5,.3,.47:P
AINT(82,86),3,3:CIRCLE(82,94),30
,1,.9,.58,.1:CIRCLE(130,72),80,1
,.5,.3,.47
220 CIRCLE(194,104),22,1,.9,.33,
.18:PAINT(194,98),1,1:PT$="V168,
084-210,118":GOSUB17:CIRCLE(194,
104),22,1,.9,.33,.18:CIRCLE(160,
120),48,1,1,.6,.88:PAINT(160,100
),2,1
230 CIRCLE(160,120),10,1,1,.75,1
:CIRCLE(160,100),10,1,.9:CIRCLE(
150,90),10,1,.9:CIRCLE(170,86),1
0,1,.9:CIRCLE(140,110),10,1,1,.5
,1:CIRCLE(120,110),10,1,.9,.5,1:
CIRCLE(130,102),10,1,.9,.5,1:CIR
CLE(140,86),10,1,.9,.28,.92
240 CIRCLE(154,82),10,1,.9,.53,.
96:CIRCLE(172,110),8,1,1,.15,.75
:DRAW"BM126,90C1R6F4D2BF8BR4R4BE
20BR6E4BL12BU2U2"
250 COLOR1,1:LINE(16,12)-(239,17
9),PSET,B:LINE(16,146)-(66,146),
PSET:LINE(239,146)-(184,146),PSE
T:PAINT(20,148),3,1
260 CIRCLE(36,10),80,1,.6,.02,.2
5:DRAW"BM36,56C1D10F6"
270 CIRCLE(222,10),80,1,.6,.25,.
49:DRAW"BM222,56C1R6D10G6D74"
280 POKE178,14:PAINT(18,20),,1
290 POKE178,26:PAINT(200,20),,1
300 POKE178,34:PAINT(130,20),,1
310 IFINKEY$<>CHR$(13)THEN310
320 PMODE3:SCREEN1,1
330 IFINKEY$<>CHR$(13)THEN330
340 PMODE3:SCREEN1,0
350 IFINKEY$<>CHR$(13)THEN350
360 PMODE4:SCREEN1,0
370 IFINKEY$<>CHR$(13)THEN370
380 PMODE4:SCREEN1,1:GOTO310
```

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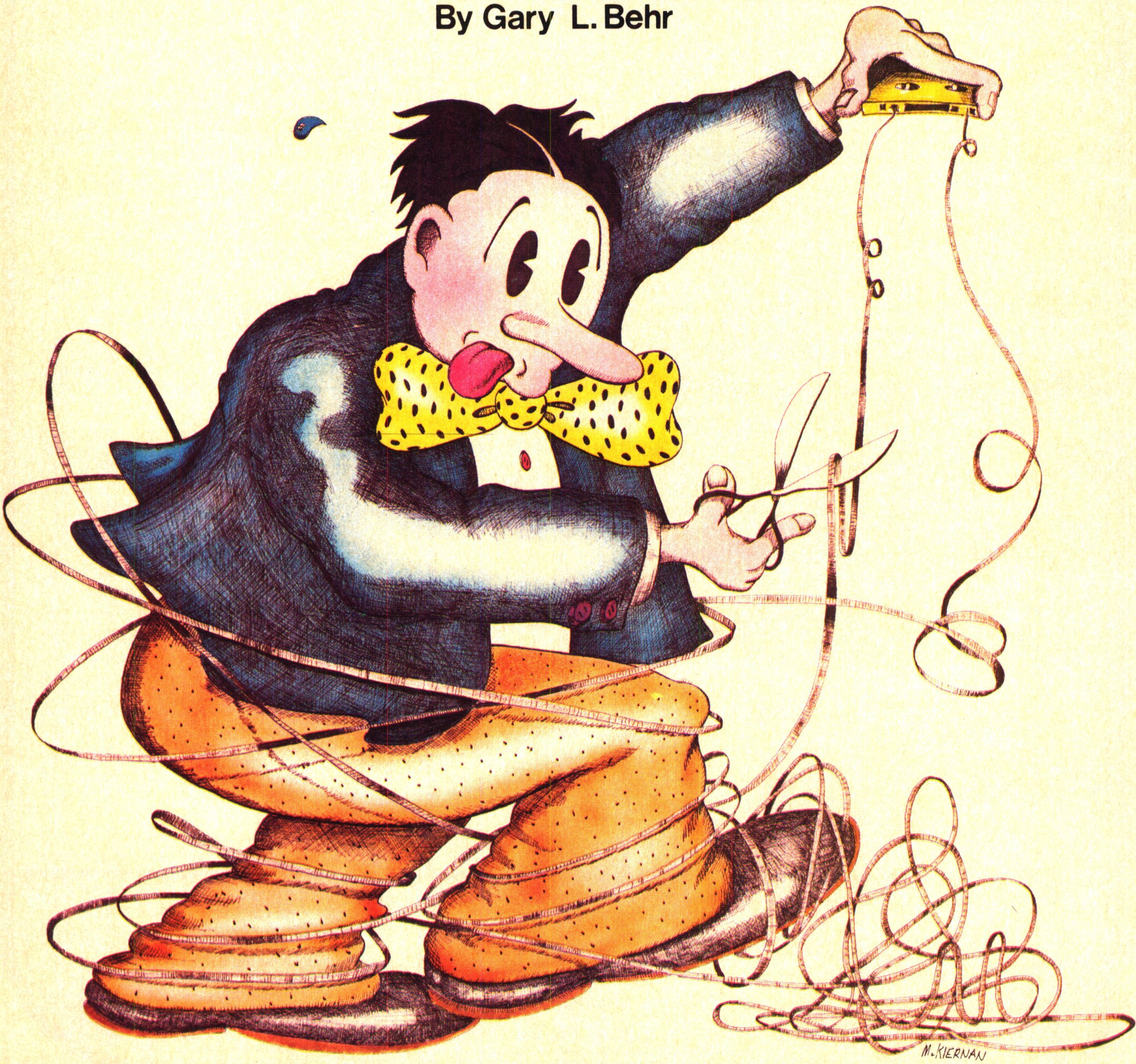
TAPE UTILITY

The Keyboard Cassette Editing System

By Gary L. Behr



If you've discovered *AUDIOON: MOTORON / AUDIOOFF: MOTOROFF* to audibly search through your cassette tape for a program, you've probably discovered it can be an absolute pain retyping the same commands over and over again. This simple program gives you one keystroke control for *ON/OFF* tape commands, and lets you completely exit the program in a two stroke sequence to begin a new program. It also sounds an audible confirmation for each keystroke. Written with two versions, it functions on either BASIC or Extended BASIC.

The *Keyboard Cassette Editor* program *(KCE)*, used in conjunction with the suggested editing method will allow you to easily update or locate any program on any tape in a matter of seconds. This program is also quite useful for editing out unwanted programs from the middle of tapes and reducing search time to a minimum.

The advantage of listening to a recorded program is it allows a person to identify exactly where and how much space a particular program occupies on the tape. Once this is determined, its position can be noted in an index log using the tape counter for quick retrieval or editing rather than going through the entire tape in the "play-search" mode.

Saving programs from computer to tape isn't hard, neither is loading them back into the computer. What the instruction book doesn't tell you is how to manage and edit your tape once you've begun *CSAVEing* all your programs!

Before discovering *AUDIOON: MOTORON / AUDIOOFF:MOTOR OFF*, I was unplugging the cassette recorder jacks every time I wanted to listen to where a particular program started and finished. When I read the same results could be accomplished using computer keyboard commands and listening to the tape through the television, life with a computer became a little easier. This also minimized the need to readjust the recorder volume control every time I listened and precluded the possibility of damaging one of the jacks.

(Gary and his wife Linda own Expressive Image Photography Studio in Madison, Wis. Although Gary has no prior computer background; business needs necessitated the purchase this year of a computer system. The simple programs Gary has written are directed toward efficient computer usage and applications for his business.)

Regrettably, not being a speed-typist, constantly re-entering *AUDIOON: MOTORON / AUDIOOFF:MOTOR OFF* became practically as challenging as plugging and unplugging the jacks. There had to be a better way.

> ***"Saving programs from computer to tape isn't hard, neither is loading them back into the computer. What the instruction book doesn't tell you is how to manage and edit your tape once you've begun CSAVEing all your programs!"***

I should first explain how I've set up my tape file. Each primary category of interest, such as: business, inventory, data, special programs, home, hobbies, games, etc., has a separate cassette representing "final" *CSAVEs* of each program. I also have a "pending" tape which represents the various programs I'm currently working on but do not yet have in final form.

With other *CSAVE* systems you have a choice of either adding on after the older version of the same program/data or recording over the older version. If you add the "updated" version after the previous version it won't be long before an entire tape has the same program in various stages of updates. If you attempt to record over the older existing version, several problems can arise. You can lose everything with an I/O Error by having a segment of the old version attempt to load with the new version (often caused by less than total erasure of the previous program). Another problem is since the updated version has more information in it, it's also longer and hence uses more tape length when *CSAVEd*, which could record over the beginning of the next *CSAVE* in the tape sequence.

My solution to these potential problems has been very effective for hundreds of error-free *CSAVEs*. First, make sure your recorder is set up properly, including periodically cleaned heads. Second, take full advantage of the recorder's digital counter by zeroing it to the beginning of each tape and setting up a simple log sheet indexing each program to a specific counter value. When you *CSAVE* a program, anticipate the maximum length after all the updates are completed. An effective way to estimate is first to note the length of the original *CSAVE* on the counter. If you think you may end up with twice as much program/data before you're finished, then double the counter length value. After you've determined the maximum length of your program/data then add another five counter units as a buffer between *CSAVEs*.

If I *CSAVEd* a current inventory listing of merchandise and the *CSAVE* began at counter number(CN) 17 and ended at CN 27, I used 10 counter units for the *CSAVE*. Realizing I'm only half done with the current listing I'd have to add another 10 counter units. I may also want to consider if the current inventory will ever be expanded, so to be safe I'd add a 20 percent expansion factor or another four counter units. Now that I have determined the total space needed for a complete inventory, including an expansion factor, my total counter units are 24. Now add five counter units as a buffer between the next *CSAVE* for a grand total of 29. Since my program began on CN 17, I add 29 and when a new (different) program/data is saved on the same tape it will begin at CN 46.

At first this may seem like a lot of blank tape between programs, but compared to sequentially saving updates, it's much more condensed. With an accurate index log you'll be able to fast forward or rewind to the beginning of any program/data in a matter of seconds. And since the program/data always begins at the same place there is no need to revise the index log entries each time a change is made.

Once you have the *KCE* running, your screen display will give you three options: EDIT, STOP or QUIT. Pressing the 'E', 'S' or 'Q' computer key will initiate each respective function (it's not necessary to use the uppercase SHIFT key). The 'E'dit key serves the same basic function as *AUDIOON: MOTORON*, the 'S'top serves as the *AUDIOOFF:MOTOROFF* and the 'Q'uit allows you to entirely exit the *KCE* program.

It is important to understand the 'Q'uit also erases the *KCE* program, allowing immediate entry of new program information. (This should also be taken into account when initially writing the *KCE* program.) Because of the total exit from the program, when the 'Q'uit key is pressed you are then prompted with "DO YOU REALLY WANT TO QUIT? - YES, NO, BREAK". If you do want to quit just press 'Y', if not, pressing 'N' will re-enter you into the *KCE* program. If you wish to make a temporary "break" from *KCE* without erasing the program itself, just press the keyboard BREAK key and you can review your *CSAVEs'* names by using the BASIC *SKIPF* command. When you're ready to return to the *KCE* editor just enter *RUN*.

You may have noticed the 'E' and 'S' keys are directly adjacent to each other and the 'Q' key is also nearby, which is not sheer coincidence. This position allows easy use for left hand access while the right hand remains free for cassette manipulation, writing notes or whatever. There isn't any need to watch which keys your depressing, as each function key has a beep response with a different tone to audibly confirm every input.

We'll use our previous inventory example to demonstrate the *KCE* program. Let's assume we've already loaded the inventory into the computer from the "final" cassette and updated the file.

CSAVE to "PEND":

CSAVE the updated version on a different, "Pend" cassette which we'll keep just for "pending" actions. Be sure to include at least one backup *CSAVE* (for convenience the *CSAVEs* can be done sequentially).

CLOAD "KCE":

Once satisfied the updated version is safely *CSAVEd, CLOAD* the *KCE* program and *RUN* it.

Ready the "Final":

Rewind the "final" cassette to the beginning and "zero" the tape counter. Now fast forward until you're positioned just before the "inventory" program, CN 12-15. Press Play on the cassette recorder and then press 'E'dit on the keyboard. The tape will begin to run and you should hear a faint hum from the blank "buffer" of the previous program as the tape advances. When the tape comes to CN 16 press 'S'top on the keyboard.

"CLEANING" the tape:

Place the recorder in the Record mode and press 'E'dit again. You are now replacing the old inventory program with a clean, blank tape space. Let the recorder "clean" the tape to the end of the full length of the anticipated program (which in this case was CN 46). When you 'S'top, you will not only stop the tape but also place a short audible "beep" on the tape for future editing orientation. (If you 'Q'uit the program while in the 'E'dit mode, the program will automatically turn off the audio and recorder without an orientation

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beep recorded on the tape.) Once you've established the tape parameters, subsequent updates will only require cleaning the tape a digit past the end of the previous version.

Position "FINAL" for CSAVE:

Rewind the cassette recorder back to about CN 15, and place the recorder in the Play mode. Press the 'E'dit once more until you are exactly at CN 17 and 'S'top the tape edit.

Reload your program:

Press 'Q'uit and answer the prompt with a 'Y' to totally exit the *KCE* program. Remove the "final" cassette from the recorder and reload your updated inventory into the computer from the "pend" cassette.

Naming your program:

Since you're permitted up to eight characters in your *CSAVE "name"*, a thoughtful suggestion would be to reserve the last three characters for a two-character revision index and separate it with a period or slash such as *"NAME/03"*. This not only allows easy review, especially during a tape search, but also offers a simple transition to future disk *SAVEs*.

CSAVE to "FINAL":

Once loaded, return to the "final" cassette and *CSAVE* in the normal manner.

Rewind the "final" cassette to the beginning, "zero" the counter, advance to about CN 16 and *CLOAD* the same program you just *CSAVEd*. This reloading will confirm an effective *CSAVE*. (If the "final" *CSAVE* would have failed, you still have several *CSAVEs* on the "pend" cassette to try again.) By zeroing the counter before *CLOADing* the present program, you can determine how much additional tape the update consumed (if the tape now stopped at CN 32, the update portion consumed five additional counter units).

I realize this may sound a bit complex, but most of it is just a logical sequence and won't require much memory. The most obvious advantages are the exceptionally precise control a person has in advancing the tape, either in the Play or Record mode, the audible "beep" to determine the program/data save boundaries and the ability to maintain concise, accurate and consistent records of program/data *CSAVEs*. In the long run it can be a very simple solution to what otherwise might become a complex maze of confusion.

Here's the *KCE* program. It's listed the Extended BASIC version, however by replacing the program subroutine with the alternate subroutine, the program will effectively run on Color BASIC.

For an effective screen display, please adhere to all spacing.

Line 170 lists *NEW;* however while you are initially writing the program replace *NEW* with *END*. This allows you to test *RUN* the program, including 'Q'uit without erasing the entire program. Once you have satisfactorily completed the program, *CSAVE* it for your backup file with the *END* command on Line 170. Then change Line 170 to *NEW* and *CSAVE* it a few times for normal editing use.

You may wish to begin your "pend" cassette with several *KCE* program *CSAVES* for fast access when editing. If you'd like a pre-*CSAVEd KCE* program on a 20-minute cassette with a copy of these usage instructions, please send your name and address along with $8 to 6818 Odana Road, Madison, WI 53719.

Listing 1:

```
10 CLSO:REM"KCE-BY GARY L. BEHR"
20 A$=INKEY$
30 PRINT@100,"  KEYBOARD CASSETT
E EDITOR"
40 PRINT@164,"PRESS"
50 PRINT@196,"<E>  TO EDIT TAPE"
60 PRINT@228,"<S>  TO STOP TAPE"
70 PRINT@260,"<Q>  TO QUIT PROGR
AM"
80 IFA$="E"THENSOUND50,1:AUDIOON
:MOTORON
90 IFA$="S"THENSOUND150,1:MOTORO
FF
100 IFA$="Q"THEN110ELSE20
110 AUDIOOFF:MOTOROFF
120 SOUND200,2:SOUND180,1:SOUND2
00,1:GOSUB180
130 CLSO:PRINT@228,"     EDITING
 COMPLETED":GOSUB260
140 FORT=1TO1000
150 NEXTT
160 CLS
170 NEW
180 CLSO
190 A$=INKEY$
200 PRINT@100,"DO YOU REALLY WAN
T TO QUIT?"
210 PRINT@215," <Y> YES"
220 PRINT@247," <N> NO"
230 PRINT@279," <BREAK>"
240 IFA$="N"THEN20
250 IFA$="Y"THEN130ELSE190
260 PLAY"P12;T4;V25;L4;G;V18;L8;
C;L8;C;L4;D;L4;C;P4;V22;L4;E;V25
;L3;F
270 RETURN
```

Listing 2:

```
260 FORS=70TO230STEP5
270 SOUNDS,1
280 NEXTS
290 RETURN
```

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You'll never miss a birthday or important appointment again! With **Don't Forget!** you can record the entire year's occasions and daily appointments ahead. Each day has spaces for 4 Special Occasions, 2 Memos, and hourly notes for 6 am through 9 pm. The built-in 51 x 24 upper and lower case hi-res display makes it very easy to read.

You can display or print any daily schedule – or a whole week at a time – so you'll remember every important event. You can even print a blank monthly calendar page with big boxes to scribble notes in!

So use your CoCo's memory and **Don't Forget!** as your personal secretary. Designed for mouse, joystick, or keyboard entry. **Don't Forget!** requires 32K and one disk drive. **Disk $27.95**

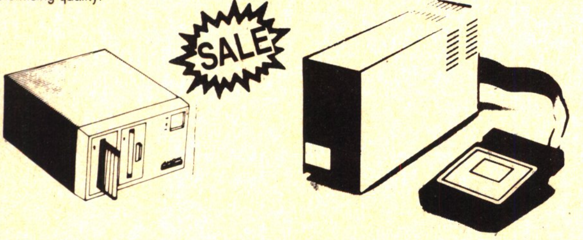
ICE HOCKEY

Begin with our national anthem, then race into action in hi-res graphics with realistic player & puck movement. One or two players compete against the real-time clock. Many skill levels. (Requires 32K)

cass $24.95 **disk $27.95**

DISK SYSTEMS

The biggest investment you'll make in your computer system will be a disk system. It will widen your computing horizons considerably and should be chosen carefully. Computerware configures systems to include the most **reliable** components at the best prices available. We do not try to be the cheapest by compromising quality!



We offer **complete systems** assembled and tested by **expert technicians**. We've been selling disk systems since 1977 so we know what you need and we make sure you get it! We use the highest quality components including **TEAC** and **Hitachi** drives. **J & M Systems** controller, all **GOLD** connectors, **heavy duty** cabinet, power supply, and cable. Our power supplies are totally adequate to insure reliability; we know dual drives need heavier power supplies! All of our TEAC and Hitachi drives come with a **6ms** step rate, full **40 tracks, slim** line size, and a one year warranty. In addition to the DOS manual, you receive a 20-page **technical manual** documenting every detail of disk drive performance and specification.

Also available from Computerware is the new Amdisk. Compatible with Radio Shack Drive 0, it is perfect for adding extra storage. Our software is available on Amdisk format for only $4 extra. (Remember every Amdisk cartridge is equivalent to two floppy diskettes.)

DISK SYSTEMS

Include J & M Controller, DOS Manual, cabinet, power supply, half-size double density drive, & all cables. (Prices quoted for JDOS. Add $10 for RSDOS.)

Single drive, Single sided	**$349.00**
Single drive, Double sided	**$399.00**
Dual drives, Single sided	**$509.00**
Dual drives, Double sided	**$599.00**

ADD ON DRIVES

Each drive add-on includes half-sized drive(s) in cabinet with extender.

Single drive, Single sided	**$229.00**
Single drive, Double sided	**$269.00**
Dual drives, Single sided	**$399.00**
Dual drives, Double sided	**$469.00**

J & M Controller	
with JDOS	**$130.00**
with RSDOS	**$140.00**
JDOS rom and manual	**$ 39.95**

AMDISK III

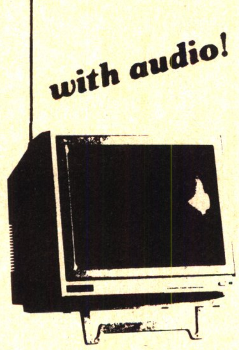
Complete Dual Drive System including controller, cable & manual. (Price quoted for JDOS. Add $10 for RSDOS.)	**$499.00**
Dual Drive and cable only.	**$375.00**

DISKETTES

Computerware double density diskettes with hub rings are of the highest quality. We love them and so will you!

5-pack **$10.95** 10-pack **$19.95** amdisk cartridges **$5.50** each

PUT A MONITOR ON YOUR COCO WITH VIDEO PLUS!



NAP Green Screen **$109.95** NAP amber screen **$114.95** Color with audio **$275.00**

NEW! IMPROVED! HIGHER RESOLUTION

We proudly introduce a **new** model of our popular NAP monochrome monitors with **higher resolution** and a more **compact** stylized case. Of course they will have the **built-in audio** – no need to add expensive amplifier or go without sound.

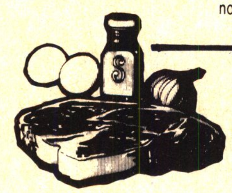
Yes! You can enjoy the crisp display of a **composite video monitor** using **Computerware's Video Plus** interface. Each is fully **assembled** and **tested**. Installation is quick, easy, and requires **no soldering**. Your TV output is not disabled. **Audio output** available. Choose the model right for your computer and monitor.

VIDEO PLUS **$24.95**
Interfaces the **original** model of Color Computer to **any** composite video monitor (color or monochrome).

VIDEO PLUS II M **$26.95**
Interfaces the **CoCo II** with a **monochrome** composite video monitor.

Video Plus II C **$34.95**
Interfaces the **CoCo II** with **any** composite video monitor (color or monochrome).

VIDEO PLUS II U **$34.95**
Interfaces the new CoCo II (model with power switch next to the TV output and chips soldered, not socketed) with any composite video monitor (color or monochrome).



CoCo Cookbook

- Can be used for ANY free-format filing system (not just recipes). Try it for periodicals and article synopsis, product reviews, real estate descriptions. . .!
- Store & retrieve a large number of recipes.
- Up to 270 recipes on a single disk using a special compression technique.
- Up to 3040 characters per recipe including title, ingredients, & instructions – all in easy to use "free form" format.
- Access each recipe by title, number, or with special keyword search (like all the recipes using "chicken!") List on the screen or printer.
- 50 recipes included FREE!
- Requires 32K and a disk drive.

32K disk **$27.95**

SAM SLEUTH

As the detective for Sam Sleuth Investigations, you are given 3 cases (of increasing difficulty):

Case of the Missing Cat
Mystery at the Museum
Baffling Bank Robbery

Using your sleuth skills (& joystick or mouse), you search the town (displayed in hi-res graphics), interviewing townspeople, collecting evidence, examining the grounds, & gathering data to solve the mysteries & apprehend the culprits. Remember, you are working against the clock!

Investigate the bank, museum, school, offices & homes, market, gas station, . . .Talk to Mike, Willy, Roy, Sue, Chrissy, . . . And keep track of those addresses & clues!

The unique graphics presentation & mouse/joystick control are as intriguing as the mysteries! (Requires 64K & mouse or joystick) **cass $24.95** **disk $27.95**

MAJOR ISTAR

MAJOR ISTAR

Under the Doomed Sea

SCENARIO: You travel to TRIDENT RESEARCH DOME because an urgent call for help is received from one of the service droids stationed there. He said help was urgently needed, but before he could say why, his transmission was cut off!

OBJECT: Solve the mystery at TRIDENT in as few moves as possible.

SETTING: In the beginning of the 21st century, undersea cities, interstellar spaceships, colonies in other planets & solar systems, worker droids, super computers, are all realities. One hero of the time is MAJOR ISTAR. In the late 1990's when space exploration & colonies began, it was necessary to form a task force to offer help to all that needed it in these hostile environments. You, Camerion J. Istar, are a highly rated member of that team and you have never failed to solve a mystery! **cass $24.95** **disk $27.95**

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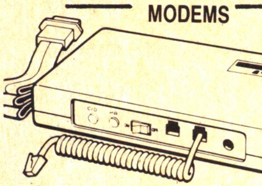
. . . is for you!

MODEMS



Signalman Mark X Modem

- Auto Answer
- Auto-Dial
- Direct Connect
- Bell 103 compatible
- Hayes Smartmodem compatible
- Full or half duplex
- 110 to 300 baud
- **$159.00** including CoCo cable

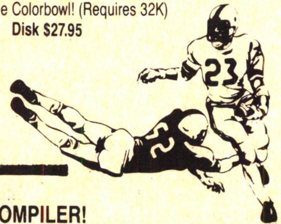
Volks Modem

- Direct connect
- Voice/Data switch
- Full or half duplex
- Bell 103 compatible
- Full or half duplex
- Requires 9 volt battery
- **$84.95** including CoCo cable

COLORBOWL FOOTBALL

Big league graphics start the football season! Two players play against each other or one can sharpen his offense against the computer. Use 8 defensive plays, 9 offensive plays, & many formations to win the Colorbowl! (Requires 32K)

Cass $24.95 **Disk $27.95**

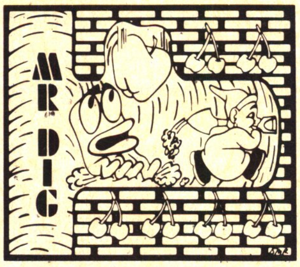


COLOR BASIC COMPILER!

If you have ever written a BASIC program only to find that it runs too slow to provide any action and haven't had the courage to learn assembler, then the **Color Compiler**™ is the answer. It lets you write your program in easy BASIC and then converts it into fast machine language. After you run your compiled program, you may find it necessary to add some delays because the **Color Compiler**™ will make your program run an average of 40 times faster.

The **Color Compiler**™ features a total of 55 commands and functions. Most of these are a subset of Extended Color BASIC. The **Color Compiler**™ is limited to integer variables. All floating point can be done in a BASIC program which calls the compiled program. Passing information from BASIC to compiled programs is very easy. **Strings are fully supported. The Color Compiler**™ generates position independent code so that you may put the compiled program anywhere in memory, including into a ROM-pack! It requires 32K and a disk drive, leaving 16K of user work space. (Room for a program with up to 200 lines and 100 line references.)

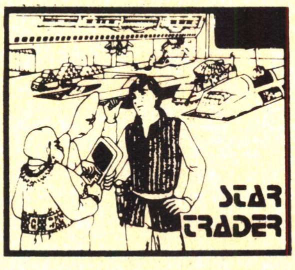
Only **$39.95**. Complete list of commands available.



MR. DIG

Cherry pickin', tunnel diggin', bad guy chasin', apple droppin', fast moving fun – DO it all with Mr. Dig. When all the DIGGIN's been DUG, go to a new screen of challenges! (Requires 32K)

Cass $27.95 **Disk $30.95**



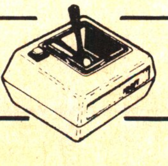
STAR TRADER

As a merchant ship captain in the far future, you travel in real-time between solar systems, trading cargo, encountering pirate ships, stopping at starports for fuel or repairs, & making money! Your goal is to earn 1,000 credits to retire in luxury!

Your graphic cockpit shows readouts of your location, damage status, credit balance, cargo destination & due date, the location of nearby starships, fuel & laser power levels, & the current date. With your joystick, you choose your next move or transaction. As you travel, transport, trade, & battle, you develop a reputation which affects your future activities & rewards.

With different skill levels & many variable factors, this simulation offers excitement & the challenge of a new game every time you play! (Requires 32K on cassette or 64K on disk, with one joystick or mouse, & Ext. Basic)

cass $24.95 **disk $27.95**



Kraft Joystick **$29.95**

SALE

DYNACALC

Dynacalc is the most powerful of the spreadsheet programs for the CoCo. The worksheet can hold up to 256 columns or 256 rows (2750 cells total) and uses a 24 x 51 hi-res display with upper and lower case characters. The cursor can be moved via arrow keys, mouse or joystick. Numbers (with 16 digits of precision) can be displayed as integers, floating point, money, or automatically plotted as a bar graph. Strings (each up to 127 characters) may be left or right justified. The screen can be split vertically or horizontally to allow viewing of separate areas of your shreadsheet.

Functions supported include:
SIN, COS, TAN, ASIN, ACOS, ATAN, LOG, LN, EXP, PI, INT, ROUND, MAX, MIN, SORT, ABS, RND SUM AVERAGE, STDDEV, NPV, CHOOSE, LOOKUP, INDEX, IF, AND, OR EOR, NOT, TRUE, FALSE, IFERROR, IFNA.

Of course, every cell can be edited and a change in one causes automatic recalculation of the entire worksheet. Line graphics, vertical bar graphs, and pie charts can be generated from your data with automatically scaled X and Y axes and caption.

The entire worksheet can be saved to disk and Dynacalc permits easy communication both ways between Dynacalc and other system programs. It has its own disk operating system built in so it does not require any other operating system software. Any part of your worksheet can be printed. All printer parameters and user-adjustable and graphics can be sent to a printer if it has dot-addressable graphics.

On top of all of this power, Dynacalc is easy to learn and use. On-screen HELP messages guide you and Visicalc-like structures minimize training.

64K Disk

(reg. $99) SALE $85.00

DISK FIX & OS-9 UTILITIES

Use your drives to the fullest and unleash the real power of OS-9 with these (including a new **Double-Sided Boot!**)

DISK FIX supports true double-sided/double-density, 40 tracks, & step rates of up to 6 ms. (That means over 368,000 bytes per drive!) Each drive is separately configurable, allowing any drive combination.

DMODE allows super easy modification of drive descriptors.

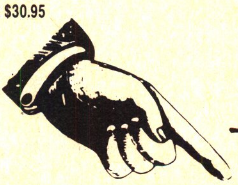
DIRCOPY is the most powerful of OS-9 copy utilities! Copy complete disks with one command, copy any subdirectory, automatically over-write existing files, sort directories in alphanumeric order while copying, replace outdated filed with current ones, etc., etc. . . .

PATCH is a very user-friendly program for inspecting and modifying any disk file. Automatic update of the file's CRC & header, powerful Find/String search capabilities, Relative Address calculation, automatic module identification & location, and memory examine and change are just a few of the capabilities!

FILELOOK displays file modules without loading them into memory.

COMPARE compares a disk file to memory.

Disk $29.95



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2% for orders over $100	Shipping*	
Air or Canada — $5 minimum.	TOTAL	
5% for orders over $100		

Checks are delayed for bank clearance

Spread your wings, child, and fly. Glide over the Plains of Content. Use your eagle eyes to find the Mountains of Intuition. Soar on their uplifting currents. Trust your psychic tailwind.

— Laran Stardrake

Binary Birthday Cakes, Letters And More Wordsworths

By Bob Albrecht and Ramon Zamora
Rainbow Contributing Editors

Basic Skills

Basic Skills is a book by Herbert Kohl. It is a wonderful and thoughtful book — a book by a philosopher and doer who has spent his life learning from children about children. We wish that every person concerned about the growth and well-being of children would read this book.

From the introduction:

> I believe in public education but do not believe that the public schools are providing an adequate basic education for our children. It is important to emphasize this distinction between public education and the current state of the public schools, between what could be and what is. We can make a decent system of public education and help our children learn to take control of their lives rather than be managed, controlled, bossed, and bewildered. This book presents a concrete program for the revitalization of public education. It is based on the idea that the fundamental goals of public education should be to develop informed, thoughtful, and sensitive citizens who are able to fulfill their personal needs at the same time that they contribute to making the whole society harmonious and compassionate. We need this wholeness now more than at any time I can remember. It is

"School is in the Heart of a Child" is for parents of quite young children. We want to help you work and play with your three- to eight-year-old child and learn to use computers as a joyful family experience. We want to suggest ways to incorporate the home computer as another means to encourage your child's independence, growth, and control over his own life. See the pride on her face as she directs the computer to do what she with deliberation selects. See her head gears switch to "on" as she progresses step-by-step with your presence and caring direction.

We will explore (we hope, with *your* help) the following:

- Specific "teaching" techniques so that the discovery can be the child's own.
- Critical evaluation of software based on extensive playtesting in family and related enviroments.
- Additional resources to consult: books, magazines, software publishers, networks, etc.
- Suggestions for interludes and fun times away from the computer (a must): call the librarian for specific information; watch a TV program together and discuss it; work together as volunteers in a community project; take a spring (or fall or winter or summer) awareness walk . . .
- Whatever we learn from families we work with in Menlo Park or from you, our readers. Let's pool our knowledge. Let's share our experiences as we all learn from our children.

We also provide small programs you can type in and use right now.

Copyright© 1984 by DragonQuest, P.O. Box 310, Menlo Park, CA 94026.

(Well-known author Bob Albrecht also writes the "GameMaster's Apprentice" feature for The Rainbow each month. Ramon Zamora is author and co-author of several books, co-founder of Computer Town USA!, and currently designing computer games for kids at Child Ware Corp. in Menlo Park, Calif.)

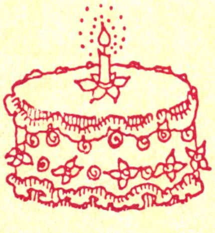
common to hear people talking about the United States suffering from "too much democracy," "an excess of freedom" and "unbridled liberty." It is time to take a serious look at ourselves and see how much democracy we really have and how far we have to go to achieve the dreams expressed by the Declaration of Independence, which dared to call life, liberty, and the pursuit of happiness rights and not privileges.

The focus of this book is on public education and the struggle to create decent schools for all of our children. I hope it will move people to stay engaged in that effort and to develop concrete programs for action in their own communities.

We suggest you get this book. If your local bookstore doesn't have it, order it directly from the publisher: *Basic Skills* by Herbert Kohl, from Bantam Books, Inc., 414 East Golf Road, Des Plaines, IL 60016, $3.95 plus $1.25 postage and handling.

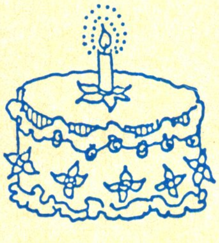
Binary Birthday Cake

Remember your first birthday? Maybe the cake looked like this:

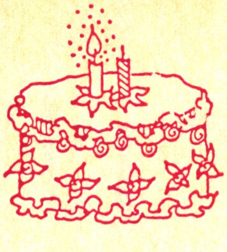


Well, on your second bithday there were two candles, on your third birthday three candles, and so on. As we grow older, the number of candles gets embarrassingly large and harder to blow out.

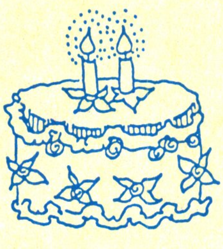
Sooo . . . why not try a binary birthday cake?



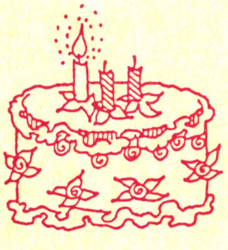
ONE YEAR OLD



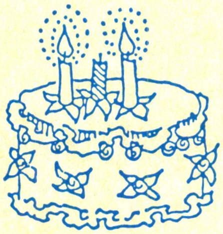
TWO YEARS OLD



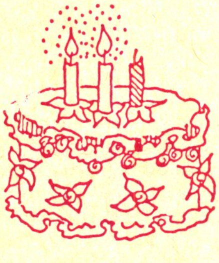
THREE YEARS OLD



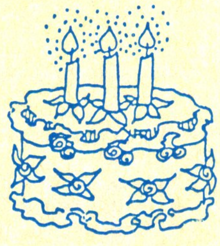
FOUR YEARS OLD



FIVE



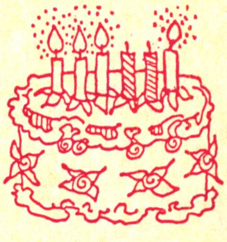
SIX



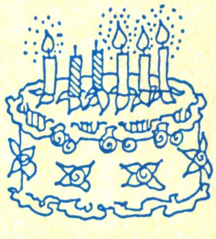
SEVEN

With four candles, we can go up to 15 years old, with five candles, up to 31 years old and with six candles, up to 63.

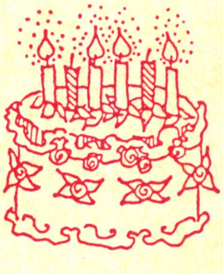
But if you are 57, get people to look at the cake from the back instead of the front . . . in fact, if you don't put something on the cake to indicate the front, your age will be ambiguous (unless, of course, it is a binary *palindrome!*). And, for all you computer people out there —



FRONT: 57

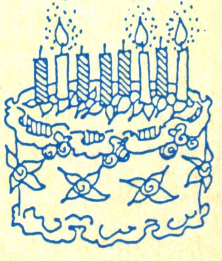


BACK: 39



A PALINDROME

How many candles would Methuselah need?
How many candles would Gandolf need?
How many candles would a dragon need?



Here is a cake with an extra BYTE

RAINBOWfest℠

Irvine

Feb. 15-17

Show Schedule:

Friday evening — Exhibit hall open from 7 p.m. to 10 p.m.

Saturday — Breakfast at 8 a.m. Exhibit Hall opens at 10 a.m. and closes at 6 p.m.

Sunday — Exhibit Hall open from 11 a.m. to 4 p.m.

Joining in the fun and excitement of **RAINBOWfest** is a great way to get to know the CoCo Community. Many of those who write for THE RAINBOW —and those who are written about — attend CoCo's very own show. It's a people-to-people event as well as a valuable learning experience.

For the 1984-85 season, we've scheduled three **RAINBOWfests** in three parts of the country. If you missed the **RAINBOWfest** in Princeton, N.J., why don't you make plans now to be with us in Irvine, Calif., or Chicago, Ill.? Each show will offer fun, excitement, new products, seminars and information for your CoCo! And for those who (perish the thought) don't like CoCo as much as you, we've scheduled each **RAINBOWfest** in an area that will provide fun and enjoyment for the whole family.

Our Irvine, California, show is being held at the Irvine Marriott Hotel, which offers special rates for **RAINBOWfest**. The show opens Friday evening with a 7 p.m. to 10 p.m. session. It's a daytime-only show Saturday — the CoCo Community Breakfast is at 8 a.m., then the exhibit hall opens promptly at 10 a.m. and runs continuously until 6 p.m. There will be no exhibition hours or seminars Saturday evening. On Sunday, the exhibit hall opens at 11 a.m. and closes at 4 p.m.

Our highly popular CoCo Community Breakfast will again feature a well-known figure from the Color Computer Community. And the exhibition will be interspaced with a number of seminar sessions on all aspects of CoCo — from writing in machine language to making your BASIC work better.

But most of all, there will be exhibitors. Lots of them. All ready to demonstrate products of every kind. Some with special programs and hardware items to introduce. Others with show specials.

Tickets can be secured directly from THE RAINBOW. We'll also send you a special reservation form so you can get your special room rate.

Come to **RAINBOWfest** . . . help us all celebrate CoCo Community at its finest.

United Airlines and THE RAINBOW have joined together to offer a special discounted fare to those attending **RAINBOWfest**-Irvine. Simply by calling United at the toll free number listed below and identifying our meeting, with account number 522-I, you will be eligible for a 20 percent discount on the Easy Saver Fare. The only requirement is a Saturday night stay.

(800) 521-4041
Account Number 522-I

RAINBOWfest-Irvine, California (L.A. area)
Date: February 15-17, 1985
Hotel: Irvine Marriott Hotel
Rooms: $65 per night, single or double
Advance Ticket Deadline: February 8, 1985

RAINBOWfest-Chicago, Illinois
Date: May 17-19, 1985
Hotel: Hyatt Regency Woodfield
Rooms: $49 per night, single or double
Advance Ticket Deadline: May 10, 1985

RAINBOWfest Irvine

Seminar Program And Speakers

• Linda Nielsen — **The CoCo Artist**
High Res Graphics

Linda, of Moreton Bay Laboratory, and several others active in the CoCo area, will demonstrate some graphics and help you to learn about some techniques you can use.

• Dale Puckett — **Beginner's Tour Of OS-9**
Beginner's Tour Of BASIC09

A free-lance writer and programmer, Dale has worked with microprocessors since 1976, and is the author of *The Official BASIC09 Tour Guide*. Dale will be available to sign copies of his new book, *The Complete RAINBOW Guide to OS-9*.

• Bob Albrecht — **School Is In The Heart Of The Child**

Bob Albrecht, RAINBOW columnist who writes "School Is In The Heart Of The Child," is one of the most prolific authors in the microcomputer world today. A specialist in writing for beginners, he is the author of numerous books, including *TRS-80 Color BASIC*.

• Jim Reed — **Writing For RAINBOW**

Jim, managing editor of THE RAINBOW, will talk about how you can submit programs and articles to magazines for fun and profit. He is also senior editor of PCM — and editorial director of SOFT SECTOR (for the Sanyo).

• Dan Downard — **Inside Your Color Computer**
Software And Hardware Interfacing

Dan Downard is the technical editor for THE RAINBOW and an electrical engineer. He has been involved in electronics for 24 years through ham radio (K4KWT). His interest in computers began about five years ago and he has built several 68XX systems.

• Don Inman
• Tim Finger
• Bob Albrecht
Along with several other panelists

A Realizable Fantasy:
The Home Dream Machine

Don Inman is a co-author of a series of booklets for Radio Shack titled *Color LOGO Guide for Teachers*. He is a former teacher and is presently a full-time author with the DYMAX group.

Tim Finger is a member of the DYMAX group, along with Don and Bob.

• Wayne Day — **Exploring CompuServe and the Color SIG**
The CoCo User and the Local Bulletin Board

Wayne Day, a traffic engineering signal technician, is the SYSOP of The Color SIG of CompuServe, the world's largest consumer information service. He is also a certified paramedic and works part-time for an Emergency Medical Service provider. His amateur radio operator call sign is WA5WDB.

• Bill Nolan
• Bob Albrecht

GameMaster's Apprentice And
Dragon's Byte

Bill Nolan, who teaches "Programming In BASIC" at the college level, owns Prickly-Pear Software Co. and has written several commercially successful software packages.

•Ken Kaplan, president of Microware Systems Corp., will be our keynote speaker at the CoCo Community Breakfast, Saturday morning at 8 a.m.

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Adventure Games For The Rest Of Us

We are looking, mostly in vain, for *easy-to-play* Adventure games rated G. We are tired of games that depend on killing as the way to success. Last time we recommended *Adventure Starter* from Owls Nest Software, P.O. Box 579, Ooltewah, TN 37363. For 16K Extended Color BASIC. On cassette for $17.95 postpaid.

We encourage all of you who want to try an easy Adventure game with your kids to get this Adventure and do it. Please share your experiences with us. We will continue playing *MYHOUSE* with kids and share our experiences with you. Why do we choose *MYHOUSE*? Because it is the only non-violent, easy-to-play Adventure game we know of for a 16K CoCo with Extended Color BASIC. As you play *MYHOUSE*, encourage your kids to make a map. Please send us maps of *MYHOUSE* and tell us about the process of learning how to make the map. Next time, we will share with you some of our map making methods.

WANTED: Non-violent, easy-to-play Adventure games. We especially want games suitable for parent and young child to play together. Why do all you Adventure game designers spend your time making increasingly more difficult games for the "elite" and "sophisticated" player? The world is full of beginners. Why not make beautiful games for them? Instead of selling 1,000 incredibly complex games to the Adventure game cult, why not sell 100,000 beautiful, non-violent games to beginners, games for "the rest of us."

We are also looking for non-violent Adventure games with several levels of play. A beginner starts with an easy game and is guaranteed moderate success, then moves up to a more difficult level, and so on. Focus on exploration and problem-solving instead of "kill monster, get treasure." Make your games realizeable realistic fantasies. As Laran Stardrake once said, "Reality expands to fill the available fantasies."

We Love The Letters!

Our greatest pleasure in writing this column is hearing from you, our esteemed RAINBOW readers. Your lettters guide us as we evolve "School is in the Heart of a Child."

Thanks, Carl H. Bloss, for two letters. We have combined them as follows:

As a new subscriber and avid reader of THE RAINBOW, I feel you should also readdress your column "School is in the Heart of a Child" to teachers, librarians and computer aides in the school. Little is done to help these people at the early critical years of children with computers. I know, I am a teacher, librarian and erstwhile programmer at a 5K level.

As an educator, I am fully aware that written curriculums often do not allow enough freedom for both the teacher and the student to explore — to work and play while learning. Schools approach learning from such a "stuffy" position that everything must be justifiable, accountable through criterion-referenced testing, or everything must have a planned outcome.

There are two schools of thought with LOGO, one following an experimential approach, the other using a planned teaching course of study. Most schools seem to be using the more restrictive planned teaching approach, even at the

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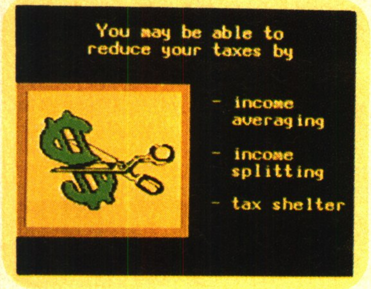
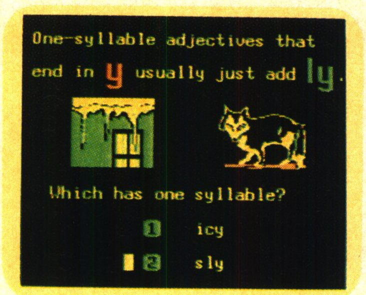


Which?
1 sister
2 smaller



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earliest levels. This is contrary to all of Papert's concepts as well as most learning theories.

Our school will have a lab of Color Computers, but not located in the library media center where I work. Since librarians work closely with the teaching staff, we are often asked for sources with ideas and materials on a variety of computer subjects. Your column, readdressed to encompass the teacher and librarian, is a tremendous source of ideas.

Thank you very much, Carl. If I ran your school, I would give you a bunch of CoCos that kids could check out and take home overnight. People like you can blend the worlds of learning — in school and out of school — so children can have the best of both worlds. We'll send you a stuffed dragon. Put him or her in your library media center to remind you to keep plugging away and write to us now and then.

We are getting lots of letters! Thanks. Our next letter is from June Lemons.

I applaud your column and your concept about the education of children. (I strongly suspect many parents are also losing their hesitancy to try using their computers by trying your programs.)

My husband and I entered the fascinating, educational, fun world of computing a short year ago. The thrill of learning all the marvelous things our CoCo can do continues on. I contrive to spend as much time as possible reading — and keying in — articles and programs from THE RAINBOW, cheerfully rising early and retiring late in my pursuit of knowledge, participating via others' creativity.

About three months after getting our CoCo, I wrote an extremely simple program for my two-year-old grandson, a program he can use to learn: 1) letter keys; 2) how to spell his name (of course, the program is easily adaptable for any child), rewarding him with his (then) favorite music, "Happy Birthday."

I have two regrets: getting acquainted with computers so late in life, and that my grandson's parents don't share my enthusiasm. But when Bennie visits, he asks to go into what he calls my computing room where he displays a marvelous grasp of letters, colors, shapes — after all, he knows what unicorns and pedometers are!

My husband has had one disappointment — I haven't been able to "draw" a cake with icing and a flickering candle to complete "Bennie's program."

Thanks, June. We think you might like "Binary Birthday Cake" in this episode of "School is in the Heart of a Child." We'll ask Don Inman how to draw the cake with flickering candles. Of course, we will send you a stuffed dragon to play with Bennie, you and the CoCo.

Letters are close to the heart of this series. We are getting lots of letters, thank you, and want more! Our next letter is from John A. McGoldrick. John has a larger sample size than most of us — he has five children, ranging in ages from three to nine.

I have just finished reading your

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a time instead of one character line. The new WORD-PAKII not only provides
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Of course the new WORD-PAKII includes all of the features of our standard
WORD-PAK such as: Basic Driver, which provides full screen editing of Basic
programs and a set of powerful screen functions; compatibility with Flex
and OS-9; completely transparent video RAM access; and the PBJ support.
```

The ultimate WORD-PAK is now available. The new WORD-PAKII includes all of the features found on our standard WORD-PAK plus ...

- **SMOOTH SCROLLING:** Smooth scrolling is the ability to scroll the display off the screen one pixel at a time instead of one character line at a time. This is a feature that is only available on terminals costing thousands of dollars and *then only on some*. Now you can add the same capability to your color computer. Smooth scrolling can be enabled/disabled under software control and even the scroll rate is programmable.
- **SOFTWARE VIDEO SWITCH:** We have added a video switch to the WORD-PAKII that allows you to select either the computer's normal video output* or the WORD-PAKII's under software control. Optimized programs can now be written to take advantage of both displays ... graphics or text, and switch back and forth under software control.
- **IMPROVED CHARACTER SET:** The characters on the WORD-PAKII are formed in an 8×10 matrix. This allows for well defined characters and full descenders. Custom character sets are also available to suit any application.
- **8K VIDEO RAM:** We have increased the amount of video RAM available on the WORD-PAKII. The board is normally supplied with 2K of RAM and is expandable to 8K.

*Requires composite video out of computer.

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```
100 REM**WORDSWORTH 1&2 SCH 10-1
110 CLS
199 '
200 REM**ASK FOR A WORD
210 PRINT
220 INPUT "YOUR WORD"; WRD$
299 '
300 REM**WL IS LENGTH OF WORD
310 WL = LEN(WRD$)
399 '
400 REM**INITIALIZE W1 & W2
410 W1 = 0
420 W2 = 1
499 '
500 REM**COMPUTE W1 & W2
510 FOR L=1 TO WL
520 : L$ = MID$(WRD$,L,1)
530 : IF L$<"A" THEN 580
540 : IF L$>"Z" THEN 580
550 : LS = ASC(L$) - 64
560 : W1 = W1 + LS
570 : W2 = W2*LS
580 NEXT L
599 '
600 REM**PRINT BOTH WORDSWORTHS
610 PRINT "WORDSWORTH #1 IS" W1
620 PRINT "WORDSWORTH #2 IS" W2
699 '
700 REM**GO FOR ANOTHER WORD
710 GOTO 210
```

article in THE RAINBOW and was quite impressed with it. Educational software was the overwhelming reason for the purchase of my Radio Shack 64K ECB this past January. I think your department "School is in the Heart of a Child" will help to fill the void that now exists.

I am the father of five children, ages nine, eight, six, five, and three. I cannot afford to buy software either based on advertisements or solely on the manufacturer's name — I have been burned both ways . . .

Parents want good educational software. They want software that will help their children become computer literate, but will not cause parents to become financial paupers in this quest.

Special thanks, John. I hope the CoCo "cottage industry" hears you. We, too, are tired of software that simply exploits the desire of parents to use the CoCo to help kids learn.

Yes, software is too expensive. You people out there who have kids, what do you want? What will you pay $9.95 for? $14.95? 19.95? and so on. What do *you* want?

If you have young children, compare the "holding power" of software with *Sesame Street*. Marido (age six), Bob, and Ramon will gladly watch *Sesame Street* repeats, several times — and that's free! Software should also have "holding power" and grow with the child. Home software should have vertical growth; school software is different — it is designed to be horizontal — more about this next time.

Wordsworth

Hooray! Several of you sent answers to our Wordsworth challenge in the August issue. Here again are the questions you answered.

1) What magic word has a Wordsworth #1 equal to the number of weeks in a year?

2) What five-letter word has the smallest Wordsworth #2?

3) What five-letter word has the largest Wordsworth #2?

4) What is the longest word (most letters) that has a Wordsworth #2 less than 20,000?

We have received answers from Amos and Josh Goldie, Lara Hansen, the Jones children, Stephen Lathom, Eric Lauterbach, and Andrea and Jenny McGinnuess. Next time we'll share their answers with you. In the meantime, send in *your* answers. Here is a Wordsworth program to compute both Wordsworth #1 and Wordsworth #2.

To answer a Wordsworth question, browse a dictionary for words to try with the above Wordsworth program. Let's all use *The American Heritage Dictionary of the English Language*, paperback edition, published by Dell Publishing Company, 1 Dag Hammarskjold Plaza, New York, NY 10017. You can buy it for $3.95 at almost any bookstore or order it from the publisher.

Here are more questions for you Wordsworth fans. Remember, all these questions refer to the *American Heritage Dictionary* mentioned above.

5) In the entire dictionary, what word has the largest Wordsworth #1?

6) In the entire dictionary, what word has the largest Wordsworth #2?

7) What is the first word (alphabetically) to have a Wordsworth #1 of exactly 100?

8) In the entire dictionary, what word has a Wordsworth #2 closest to 1,000,000?

Send us your answers. We will put all answers received by December 31, 1984 in a box, shake 'em up, and draw a winner. The winner will receive, of course, a stuffed dragon.

DragonSmoke

Koala Pad is alive and well at Radio Shack! Look for it on Page 164 of the 1985 Radio Shack Catalog No. 380 or Page 52 of the 1985 TRS-80 Catalog No. RSC-12. They call it the TRS-80 Touch Pad, Catalog No. 26-1185, price $59.95. OK, cottage industry — let's get busy and write software for this marvelous addition to the CoCo family.

We have decided to publish a little newsletter called *DragonSmoke* about four times a year. If you want a free copy, send a self-addressed, stamped envelope to *DragonSmoke*, P.O. Box 310, Menlo Park, CA 94026.

Helping Youngsters Form Categories

By Steve Blyn
Rainbow Contributing Editor

The young child deals with new items and experiences as unique events. He has a small fund of knowledge to draw from. He has yet to learn to classify things into groups of similar things. Children often seem fascinated by what appears to us to be something quite commonplace; they cannot place the item into a familiar category.

As we grow in experience, we begin to define items into narrower categories. The Color Computer can be an example — a beginner might at first think of the CoCo as merely a type of computer. The more experienced user knows it is in the 6800 family of computers rather than the 6500 or Z80 families. These distinctions become more important as your knowledge and needs increase.

Software is another example. Upon purchasing a computer, most people usually want to accumulate almost any kind of software. There is a need to see what the new machine can actually do. After a while, we break the software down into categories or specific areas such as business, education, leisure, etc. We begin to specialize. Many of us then further specialize within an area to several favorite specific companies. Some of us even go further into specific requirements within the programs of specific companies such as OS-9 programs only or networkable programs only.

(Steve Blyn teaches both exceptional and gifted children, holds two master's degrees and has won awards for the design of programs to aid the handicapped. He and his wife, Cheryl, own Computer Island.)

This type of refinement of categories is part of the human experience. We constantly redefine as our knowledge grows in any field. This helps us to deal with our world. There are too many items and events to deal with individually. As we grow, we learn to place them in various categories to help us effectively deal with the world around us.

> ***"Too often, school curricula require some of the children to deal with abstract concepts before they have secured sufficient experience on earlier levels of experiences in that subject. This can lead to inadequate and insecure learning."***

Learning proceeds from concrete to abstract concepts. First we can deal only with single objects and later with categories. This process proceeds according to age and experiences at individual levels. Too often, school curricula require some of the children to deal with abstract concepts before they have secured sufficient experience on earlier levels of experiences in that subject. This can lead to inadequate and insecure learning.

The famous child psychologist,Jean Piaget, once performed an experiment to help study the levels of categorization in children. Three girls, aged seven, nine and 11 were asked to pack clothing in two suitcases. The way they would decide to arrange their clothing into the suitcases could reveal much about their thought processes.

The seven-year-old first filled one suitcase randomly with clothes until it was full and then packed the other with the remaining clothing. No real thought was given to any categories of clothing.

The nine-year-old thought for a while, and then packed all clothing worn above the waist in one suitcase and clothing worn below the waist in the other. The top part of her pajamas and a two-piece bathing suit were placed in one suitcase and the bottoms in the other.

The 11-year-old was more adult-like in her thinking and packed clothes worn during the day in one suitcase and night clothes in the other. It can easily be seen from this experiment different levels of organization of the same items.

This month's program naturally deals with grouping and categorization. The key element in this program is the *DATA*. We had to select one area and chose sports terminology. This was purely subjective on our part: one subject had to be chosen. Please do not restrict your program to our chosen topic.

The *DATA* that you choose to enter should be age appropriate for your child. Younger children might, for example, group food items by fruit, vegetable or dairy. Older students might group chemical compounds by acid, base or salt. The *DATA* that you enter could also be the child's choice. This would further involve the student in the computer.

The goal for the user of this program is to arrange the 12 words properly underneath the three category words. The words are moved one at a time by the arrow keys. After the twelfth word is moved, a list of the 12 words in their correct categories appears. The child can compare this list to the one that he has just completed.

Lines 40-50 set the dimensions and read the *DATA*. Line 70 prints the data words. These are the A$ words: The B$ letters will never be printed on the screen. Line 80 prints the category headings. (Your headings may vary from ours). Line 140 prints one of the words and lines 120-130 set the limits of the word so that it does not mess up the screen.

Lines 180-250 let you move the word around the screen. The arrow keys are represented by the character string *(CHR$)* numbers 8, 9, 10 and 94. When one of the arrows is pressed, the key word to be classified is moved. *CHR$(13)* represents the ENTER key. When it is pressed, the next word appears. Lines 300-360 read and print out the correct list for comparison purposes.

The *DATA* on Line 410 consists of 12 pairs of information. A word to be classified and an abbreviation for the classification make up one pair. They are the A$ and B$ portions. The abbreviations do not get used until needed on lines 320-340. Here, the computer interprets the B$ part and places the word in the correct category.

The *DATA* supplied is merely one of literally thousands of possible choices. Use your imagination to help your children better classify things or events in their schoolwork and daily lives.

190 190
END 218

The listing:

```
10 REM"CATEGORIES"
20 REM"STEVE BLYN,COMPUTER ISLAN
D,1984
30 CLS0
40 DIMA$(12),B$(12)
50 FORT=1TO12:READA$(T),B$(T)::N
EXT
60 PRINT"      here is the word l
ist"
70 FORT=1TO12:PRINTA$(T),:NEXTT
80 PRINT"   baseball   tennis    h
ockey"
90 B$=STRING$(8,128)
100 N=451:Y=1
110 REM"SET LIMITS OF WORD PLACE
MENT"
120 IF N<259 THEN N=259
130 IF N>476 THEN N=476
140 PRINT@N,A$(Y);
150 J=258:FORT=1TO4:PRINT@J,CHR$
(249);:J=J+32:NEXTT
160 K=268:FORT=1TO4:PRINT@K,CHR$
(249);:K=K+32:NEXT T
170 L=277:FORT=1 TO 4:PRINT@L,CH
R$(249);:L=L+32:NEXT T
180 REM"USE THE ARROW KEYS TO MO
VE THE WORDS"
190 A$=INKEY$
200 IF A$=CHR$(8) THEN PRINT@N,B
$;:N=N-1:GOTO120
210 IF A$=CHR$(9) THEN PRINT@N,B
$;:N=N+1:GOTO120
220 IF A$=CHR$(94)THEN PRINT@N,B
$;:N=N-32:GOTO120
230 IF A$=CHR$(10) THEN PRINT@N,
B$;:N=N+32:GOTO120
240 IF A$=CHR$(13) THEN Y=Y+1:N=
451:SOUND150,2:IF Y>12 THEN 270
ELSE 120
250 GOTO 190
260 REM"GET & PRINT THE CORRECT
LISTS"
270 PRINT@384,STRING$(32,239);:F
ORT=1TO9:PRINTSTRING$(32,128);:N
EXTT
280 PRINT@194,"here are the corr
ect answers";
290 D=227:E=237:F=246
300 RESTORE:FOR G=1TO12:READA$(G
),B$(G)
310 FORG=1TO12
320 IF B$(G)="B" THEN PRINT@D,A$
(G);:D=D+64
330 IF B$(G)="T" THEN PRINT@E,A$
(G);:E=E+64
340 IF B$(G)="H" THEN PRINT@F,A$
(G);:F=F+64
350 SOUND230,1
360 NEXT G
370 PRINT@486,"PRESS ENTER TO GO
 ON";
380 EN$=INKEY$
390 IF EN$=CHR$(13) THEN RUN
400 GOTO 380
410 DATA LOVE,T,ICING,H,FACEOFF,
H,TRIPLE,B,DUECE,T,GOALIE,H,MOUN
D,B,RACKET,T,PUCK,H,PLATE,B,BALK
,B,FAULT,T
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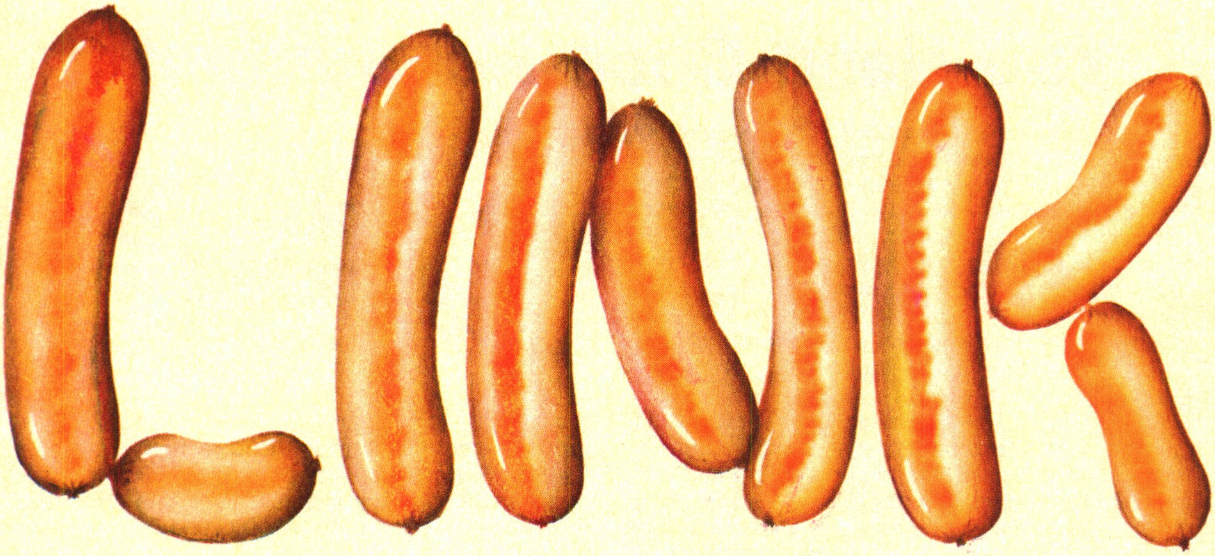
Here's a program that concatenates RAM records and writes them on tape. It's your missing . . .



LINK

By H. Allen Curtis

Can you do the following with a single cassette load command?

1) Load the text screen to display an introductory message or low resolution picture;
2) Load a BASIC program;
3) Load the graphics screen with a high resolution picture for subsequent display;
4) Load automatically memory protected high RAM with assembly language routines to be called by *USR* functions;
5) Automatically start the BASIC program; and
6) Provide some piracy protection for your program.

If you cannot, then you are missing *Link*. No, I did not mean that you are *the* missing link, but that you are missing out by not using the *Link* program to be presented in this article.

(H. Allen Curtis resides in Williamsburg, Va. He is interested in 17th and 18th century history and enjoys biking through the colonial capital. He balances past and present with his computer work.)

Link is not a pre-loader. That is, *Link* does not have to be loaded into RAM before you issue the command to load your program, screens and subroutines. *Link* concatenates (links) as many as 10 non-contiguous RAM records and writes them on tape. A record is defined here as any program (BASIC or assembly language), any contiguous assembly language routines, or any set of stored data. The linked records written on tape are simply loaded by means of BASIC's *CLOADM* command.

If you want to employ *Link* to record and auto-start an assembly language program instead of a BASIC program, you can readily do so. In fact, *Link* is an assembly language program which will be used to record itself.

Link has the ability to write a record from one RAM location and load it into another specified RAM location without recourse to the offset feature of the *CLOADM* command. Thus, for instance, you may design several text screens, transfer them to new locations in RAM and then use *Link* to write them on tape for future sequential loading and display on the text screen. The fact that you relocate one or more records such as screens does not require you to relocate the other records to be linked and written.

The order in which records are concatenated is left to your discretion. If you, for example, have more than one text screen to be loaded and displayed, you would probably load one or two records between screen records to allow the screen to be displayed for a sufficiently long time.

Link can be employed as part of a protection process for your programs. How *Link* can be used in this way will be discussed in detail at the close of the article.

The program of Listing 1 generates *Link* and stores it in RAM. The strings in lines 20 through 120 of Listing 1 are messages used by *Link* to prompt you in the process of concatenating records and writing them on tape. The values in the *DATA* statements of lines 210 through 520 comprise *Link* routines that actually do the linking and writing of the records on tape. The values in the remaining *DATA* statements form the major portion of the first record to be written on every *Link* produced tape. You do not specify this record. The record is *Link's* means of altering the usual *CLOADM* sequence of instructions to permit the proper loading of concatenated records.

Incorporated into Listing 1 is a check on the accuracy of your typing of the

DATA statements. Thus, with the use of Rainbow Check Plus you are doubly aided in the correct typing of Listing 1. When you have correctly typed Listing 1 and run the program without the occurrence of any error messages, save it on tape: Type *CSAVE"GENLINK"* and press ENTER.

After saving the program of Listing 1, run it again. Then type *EXEC* and press ENTER. This action will produce the first prompt of *Link*. *Link* requires you to provide a filename for the concatenated records to be put on tape. Usually the filename will be that of the main pro-

200	232
370	72
END	105

Listing 1:

```
10 'ENTRY ADDRESS IS &H1100; FIR
ST ADDRESS IS &H1000; LAST ADDRE
SS IS &H132B
20 A$="TYPE & ENTER
30 B$="FILENAME:
40 C$="TYPE (IN HEX)
50 D$="ENTRY ADDRESS:
60 E$="POSITION TAPE
70 F$="FIRST SOURCE
80 G$="LAST
90 H$="FIRST DESTINATION
100 I$="ALL RECORDS SPECIFIED?
 (Y/N)
110 J$="READY CASSETTE TO RECORD
120 K$="THEN PRESS ENTER
130 X=256*PEEK(VARPTR(A$)+2)+PEE
K(VARPTR(A$)+3)
140 FORI=0TO 174
150 POKEI+&H1000,PEEK(I+X)
160 IFPEEK(I+X)=0 THENX=X+8
170 NEXT:IFPEEK(398)=57THENPOKE3
99,174:POKE400,64:POKE398,126
180 FORI=0TO596:READL$:L=VAL("&H
"+L$):E=E+L:POKEI+&H10AF,L:NEXT
190 FORI=0TO76:READL$:L=VAL("&H"
+L$):E=E+L:POKEI+&H1E2,L:NEXT
200 IFE<>78082 THENCLS:PRINT"DAT
A ERROR"ELSEPOKE&H9D,17:POKE&H9E
,0
210 DATA 5F,30,1,A6,84,26,FA,8D,
1F,84,F,97,7D,8D,12,9A,7D,97,7D
220 DATA 8D,13,84,F,97,7C,8D,6,9
A,7C,97,7C,5D,39,8D,5,48,48,48
230 DATA 48,39,8C,2,DD,27,15,A6,
82,81,30,25,11,81,3A,25,C,81,46
240 DATA 22,9,81,41,25,5,8B,9,81
,4F,39,C6,8,D7,8C,7E,A9,51,7E,A9
250 DATA 28,7E,B9,9C,8D,F8,8D,26
,31,8D,FF,21,30,A8,D6,8D,F0,8D
260 DATA 1E,8D,12,C6,8,30,1,CE,1
,DA,A6,80,27,36,A7,C0,5A,26,F7
270 DATA 20,36,8D,D8,C,89,7E,A3,
90,86,A3,8C,86,C3,97,89,39,8D,C6
280 DATA 30,A8,ED,8D,F1,8D,C2,30
,88,DF,8D,BD,20,EB,8D,B9,1F,21
290 DATA 20,DB,8D,E8,96,44,BD,A2
,85,C,89,39,86,20,A7,C0,5A,26,FB
300 DATA 8D,D7,30,88,18,8D,C3,A6
,1,81,58,26,5,8E,2,20,20,7,17,FF
310 DATA 41,26,E9,9E,7C,BF,1,E5,
BF,2,1E,CE,2,2F,DF,45,C6,31,D7
320 DATA 44,33,8D,1,7F,DF,42,8D,
BF,30,A8,18,8D,B4,A6,1,81,58,26
330 DATA 39,DE,42,CC,0,19,ED,C4,
9E,45,ED,84,C6,20,ED,42,DC,19,ED
340 DATA 44,ED,2,DC,1B,ED,46,8D,
A,8D,8,C,44,8D,11,25,72,20,5E,DE
350 DATA 42,33,44,DF,42,DE,45,33
,42,DF,45,39,C,44,86,39,91,44,39
360 DATA 17,FE,DF,26,B5,DE,42,DC
,7C,ED,C4,17,FF,6D,30,A8,25,8D
370 DATA 79,30,13,17,FF,5D,17,FE
,C7,26,EE,DE,42,DC,7C,ED,42,17
380 DATA FF,55,30,A8,2A,8D,61,1F
,21,8D,5D,86,E3,97,89,BD,A3,90
390 DATA 17,FE,A9,26,E8,DE,45,DC
,7C,ED,C4,8D,B6,25,13,8D,A5,BD
400 DATA A9,28,30,A8,3C,8D,3D,BD
,A1,B1,81,59,10,26,FF,62,9E,45
410 DATA 6F,84,6F,1,FE,1,8F,FF,1
,FF,CE,1,E9,FF,1,8F,DC,74,7F,2
420 DATA 45,DE,42,83,0,E8,DD,7C,
30,1E,8C,2,2D,27,2E,33,5C,EC,42
430 DATA A3,C4,E3,84,10,93,7C,22
,17,20,EA,7E,B9,9C,8D,FB,17,FE
440 DATA CC,30,A8,74,8D,F3,BD,A1
,B1,81,D,26,F9,39,AE,84,30,1F,BF
450 DATA 2,46,7A,2,45,A,44,BD,A9
,28,17,FE,AA,BD,A7,CA,30,2A,8D
460 DATA D5,BD,A7,E9,BD,A9,28,17
,FE,9A,30,A8,5B,8D,C7,30,8C,6C
470 DATA 9F,42,8E,0,F,9F,7C,8E,1
,DA,9F,7E,BD,A7,E5,BD,A7,D8,8E,1
480 DATA 8E,9F,7E,8E,1,BA,9F,7C,
8D,2F,D6,44,C0,30,D7,44,8E,0,1
490 DATA 9F,7C,8D,22,9E,42,AE,84
,9F,7E,CE,1,FF,DF,7C,DE,42,EC,42
500 DATA C3,0,1,93,7E,27,F,10,83
,0,FF,24,2,D7,7D,8D,2,20,E2,7E
510 DATA A7,F4,0,7C,F,7D,8D,F7,9
E,42,30,4,9F,42,A,44,26,CD,BD,A7
520 DATA E9,BE,1,FF,BF,1,8F,16,F
D,FC
530 DATA 2,0,0,0,0,1,8E,35,10,B6
,2,45,27,E,FC,2,46,DD,27,DD,23
540 DATA 83,0,C8,DD,21,1F,4,8E,0
,0,BF,1,8F,CE,2,2F,AE,C4,9F,7E
550 DATA BD,A7,F,26,1C,D,7C,2A,F
5,33,42,AE,C4,26,EF,BD,A7,E9,7E
560 DATA 0,0,BD,AD,21,9E,A6,30,4
,9F,A6,7E,AD,C0,7E,A6,19
```

gram whether in BASIC or assembly language. Rather than having a BASIC program that generates *Link*, it is more convenient to have *Link* recorded on tape directly as an assembly language program. Therefore, type the filename *Link* and ENTER it. This will initiate the process of using *Link* to record itself on tape.

The second prompt requests the entry address of the main program, which in this case is *Link*. All the required *Link* addresses have been provided in the REM statement of Line 10 of Listing 1. In accordance with that REM, type 1100 and press ENTER. You do not need to type &H in answering the prompt. The hexadecimal address 1100 is the address at which *Link* starts executing. If any of the characters of the ENTERed address are not a valid hexadecimal digit, a beep alarm will be sounded and the prompt will be repeated.

The next prompt asks for the first source address of the first record that you want on tape. Associated with each record are two sets of addresses — source addresses and destination addresses. The source addresses are the lowest (first) address and the highest (last) address of the record as it is presently located in RAM. The destination addresses are the corresponding RAM addresses into which you want the record to be loaded.

In the case of *Link*, only one record is involved; hence, you should type the first source address of *Link*. That is, type 1000 and press ENTER.

The third prompt is similarly answered by typing and entering the last source address 132B of *Link*.

You will probably want at least two versions of *Link*, one to be loaded in its present RAM location and one destined for high RAM. Therefore, for the former version answer the fourth prompt by typing 1000 and pressing ENTER.

Since you only need to specify one record for *Link*, answer the next prompt by pressing the 'Y' key to indicate yes.

Instead of recording *Link* immediately following *GENLINK* on your cassette tape, it would be more convenient to record *Link* at the beginning of the reverse side of the tape. Therefore, flip the cassette over, rewind the tape and position it. Then answer the positioning prompt by pressing ENTER.

In accordance with the next prompt, depress the Play and Record buttons of your recorder and then press ENTER. When the recording is finished, the recorder will stop and the initial prompt of *Link* will return.

Now, you can repeat the process to produce a high RAM version of *Link*. Therefore, type the filename *HILINK* and press ENTER. The requested entry address of *HILINK* is the destination entry address which is 3DD4 or 7DD4 depending on whether you have a 16K or 32K RAM, respectively. The first and last source addresses that you must type are the same as previously, 1000 and 132B. The first destination address is 3CD4 or 7CD4 for a 16K or 32K system, respectively. When you later load *HILINK,* you will not have to use the *CLEAR* command to memory protect it. *HILINK* will be automatically memory protected.

A detailed example will be presented to illustrate how to use *Link*. However, before that presentation, it would be well to determine whether or not you have good recordings of *Link* and *HIL INK.* Do *not* use *SKIPF* to make that determination. Use of *SKIPF* on any *Link* produced recording will always yield an I/O Error message. *Link* purposely forces an I/O Error to occur as a means of altering the *CLOADM* command routine. *Link* changes the "hook" that links the ROM and RAM when errors occur. The new hook causes entry to be made to the first loaded record which controls the loading of all succeeding records. The original hook is restored before loading the subsequent records. Hence, those records are checked for I/O Errors as they are loaded.

To test the recordings of *Link* and *HILINK* do the following: turn off your computer and then turn it on again. Type *CLOADM* and press ENTER. Rewind the tape and position it. Finally, depress the Play button. While *Link* is loading, note that the letter 'F' at the top leftmost position of the screen stops blinking. The blinking of 'F' on all *Link* produced recordings will be suspended. The purpose of suspending the blinking of 'F' is to guarantee the unmarred loading of the text screen when you desire to precede the running of the main program with one or more screen messages or pictures. If the recording is good, no I/O Error message will occur. Furthermore, upon the completion of loading, *Link* or *HILINK* will automatically start and the initial prompt will appear on the screen. To exit from *Link* for the *CLOADMing* of *HILINK* press the Reset button. Before you load *HI LINK,* note the recorder counter setting for later reference.

If you should happen to have a bad recording of either *Link* or *HILINK, CLOAD* the program *GENLINK* and run it. Then type *EXEC,* press ENTER and repeat the process of recording *Link* and *HILINK* on a new tape.

The programs of listings 2 and 3 are integral parts of the example to illustrate how to use *Link*. Lines 10 through 70 of Listing 2 construct a text screen and transfer its contents to another area of RAM. Lines 80 through 100 produce a simple, high resolution graphics display. The remaining lines of Listing 2 generate a machine language routine and store it in RAM. *Link* will be employed in concatenating and recording the text screen, graphics screen, machine language routine and the BASIC program of Listing 3.

When you have typed the program of Listing 2 correctly, run it. You may wish to save it as a precautionary measure. After running the program of Listing 2, erase it via the *NEW* command. Then type Listing 3.

Line 10 of Listing 3 turns on the previously loaded graphics display. The remaining lines "paint" the display in a

Listing 2:

```
10 CLS:K=255
20 FORI=0TO31:POKEI+J+&H400,K:NE
XT
30 K=K-16:J=J+32:IFK>142THEN20
40 PRINT@238,"LINK";:PRINT@268,"
EXAMPLE";:K=K+32
50 FORI=0TO31:POKEI+J+&H420,K:NE
XT
60 K=K+16:J=J+32:IFK<256THEN50
70 FORI=0TO511:POKEI+&H2A00,PEEK
(I+&H400):NEXT
80 PMODE4:PCLS:SCREEN1,1
90 CIRCLE(128,96),85
100 PAINT(128,96),1
110 FORI=0TO23:READA$:A=VAL("&H"
+A$):POKEI+&H2D00,A:B=B+A:NEXT
120 IFB<>3116THENCLS:PRINT@267,"
DATA ERROR":STOP
130 DATA BD,B3,ED,DD,44,9E,BA,33
,89,18,0,DF,42,A6,84,98,45,A7,80
,9C,42,26,F6,39
```

Listing 3:

```
10 PMODE4:SCREEN1,1
20 A=256*PEEK(116)+&HE8:DEFUSR=A
30 FORJ=0TO1
40 A=USR(85):GOSUB80
50 A=USR(170):GOSUB80:NEXT
60 PMODE3:SCREEN1,L:IFL=0THENL=1
ELSEL=0
70 GOTO30
80 FORI=0TO300:NEXT:RETURN
```

variety of colors. The color changes are achieved primarily through the machine language routine called by the *USR* functions of lines 40 and 50. This routine is assumed by the program to have been loaded into the high RAM and automatically memory protected there. The example would be more realistic if the graphics screen had contained an intricate drawing requiring considerable program memory to produce it. In such a case the loading of the completed drawing would result in a significant savings in program memory. Frequently, the saved memory could be put to profitable use in program expansion and improvement.

Do not run the program of Listing 3 when you have finished typing it correctly. Instead refer to the previously noted recorder counter setting in positioning the tape for *CLOADMing HILINK*. *HILINK* rather than *Link* is used here because *Link* loads into the graphics screen memory area and would therefore ruin the display generated by the program of Listing 2.

The completion of the loading of *HILINK* is signalled by the appearance on the screen of the first prompt. Answer it by typing and entering the filename *EXAMPLE*. Usually the next prompt requires the typing of a hexadecimal address. There is one exception. That occurs when the main program is in BASIC, which is the present situation. In such a case, just press the 'X' key and then ENTER.

The text screen was stored by the program of Listing 2 in the RAM area from 2A00 through 2BFF. Hence, answer the next prompt by typing and entering 2A00. Similarly, type and ENTER 2BFF in response to the last source address prompt. Because you will want the text screen to reside in the usual location, answer the destination address prompt by typing 400 and pressing ENTER.

In order to specify the second record, press the 'N' key in response to the next prompt. The second record is the graphics screen. If you have a cassette-based system, the screen resides at addresses 600 through 1DFF. However, if you have the Disk BASIC ROM connected, the graphics screen is located at addresses E00 through 25FF. Thus, your response to the first source address prompt should be the typing and entering of 600 or E00 depending on your system. Likewise, for the last source address prompt, type either 1DFF or 25FF and ENTER. In response to the destination address prompt type and ENTER 600 or E00 for cassette or disk-based systems, respectively.

"... Link can be used as part of a scheme to protect your programs against piracy. There is a simple, yet fairly effective scheme for piracy protecting assembly or machine language programs."

Press 'N' to permit the specification of the third record. This record is the BASIC program of Listing 3. Typing and entering X will automatically take care of all address specification for you. Actually, an additional record will also be automatically specified. The additional record is only eight bytes long and consists of the vital BASIC program pointers at hexadecimal addresses 19 through 20 (corresponding to decimal addresses 25 through 32).

There is one more record to specify, so once again press 'N' in response to the record's specified prompt. Even though the previous record was numbered three, the present record has been given the number five. The number four record was the eight-byte record automatically specified along with the BASIC program. Record five is the machine language routine generated by the program of Listing 2. It was stored at RAM addresses 2D00 through 2D17. However, it is to be loaded into high RAM at addresses 3FE8 through 3FFF or at 7FE8 through 7FFF depending on whether you have a 16K or 32K RAM, respectively. Therefore, each of the next three prompts should be answered by typing and entering, in order, one of the addresses: 2D00, 2D17 and 3FE8 or 7FE8.

Complete the process by pressing 'Y' and appropriately carrying out the instructions of the final two prompts. In positioning the tape make a note of the counter setting of the recorder for later loading of *EXAMPLE*. The signal that recording is finished is the return of the initial prompt to the screen. You will have a rather long wait for the prompt because of the 6K length of the graphics screen record.

In general, you may specify a maximum of nine records. If one of the specified records is a BASIC program, the most that you may specify is eight records unless the BASIC record is the ninth one specified.

Back to the example, load *EXAMPLE* by means of the *CLOADM* command. You should be quickly greeted with the text screen generated by the program of Listing 2. This screen will remain on display for the time needed to load the other records including the rather lengthy graphics screen. When loading is complete, the BASIC program will automatically start and the graphics screen will replace the text screen. The *USR* called machine language routine will keep changing the colors in the display. To end the program press the BREAK key.

For those with disk systems it is worthwhile interjecting a short note of caution. If you record a tape using *Link* with the disk ROM connected, always load the tape with a connected disk ROM. Likewise, if the tape is recorded with the disk ROM disconnected, always load it with the disk ROM disconnected; otherwise, problems would be likely to occur in the execution of the associated programs.

As was previously mentioned, *Link* can be used as part of a scheme to protect your programs against piracy. There is a simple, yet fairly effective scheme for piracy protecting assembly or machine language programs. The scheme will be illustrated by adding protection to *Link* itself.

With the present unprotected version of *Link*, the Reset button can be pressed to return to the CoCo's command mode in which an *EXEC* command can be employed to gain entry to a preloaded

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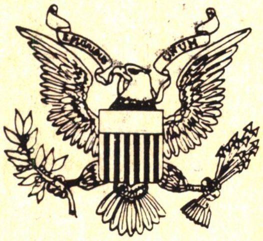

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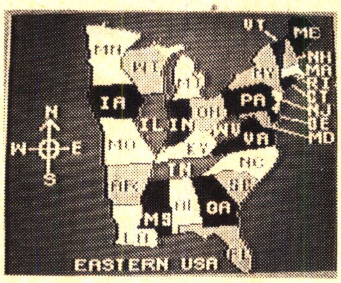
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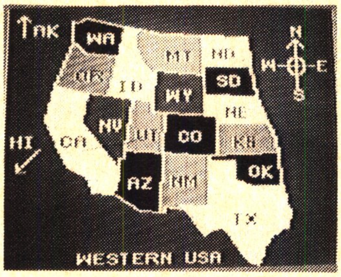
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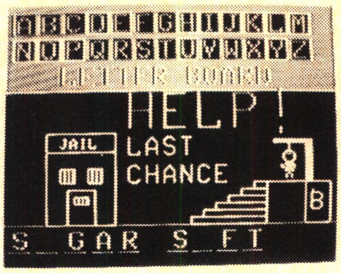
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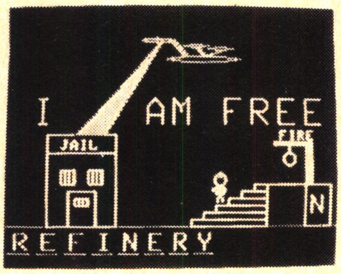
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Disk compatible

program to analyze *Link*. In the proposed protected version of *Link* every BASIC command will be disabled and will result in an immediate error message when issued.

To add this protection to *Link*, turn your computer off and on again and load *Link*. Then give this version of *Link* the filename *PROLINK*. As you did previously, type and ENTER 1100 for the *Link* entry address. However, before specifying the *Link* program record, you must specify the protection record. It consists of six consecutive zero bytes. Locations 250 through 255 contain such bytes. Therefore, the first and last source addresses are 250 and 255, respectively, in the first record specification. For the first destination address, type 120 and ENTER it. Addresses 120 and 125 are usually stored the number of statements and functions, respectively, in the Color BASIC repertoire of commands. Making those quantities zero tricks the BASIC interpreter into "thinking" that it has an empty vocabulary.

Type 'N' to allow the specification of the *Link* program record. Carry out the remainder of the procedure exactly as you did in the production of the unprotected *Link*.

Some of you who are well versed in assembly language programming and are familiar with the CoCo's memory map may already see a way around this protection scheme. One of the hooks that link the ROM and RAM could be the means of gaining entry to a preloaded program for analyzing *Link*. The occurrence of an error could be made to cause such an entry. Therefore, to make protection more effective you should specify a second protection record before the *Link* program record. This second record consists of the hooks located at RAM addresses 15E through 18D. There are other hooks but they have already been accounted for in the loader record which is always written on tape without your specifying it. Hence, when you are further protecting a program, 15E, 18D and 15E should be the first source, last source and destination addresses of the second specified record.

BASIC programs cannot be protected in the same manner as assembly or machine language programs. A BASIC program clearly could not run if its commands were disabled. The scheme

BASIC programs cannot be protected in the same manner as assembly or machine language programs. A BASIC program clearly could not run if its commands were disabled. The scheme

for protecting any BASIC program does not disable the BASIC commands during program execution but does so when the program has been stopped by any means.

As in the more effective scheme for piracy protecting assembly language programs, the hooks at addresses 15E through 18D must comprise one protection record. However, one hook address in the record must be changed to point to a short machine language subroutine which forms a second protection record. The subroutine is what controls whether or not BASIC commands are disabled.

The objective of the program of Listing 4 is to generate the two protection records and store them in a convenient place in RAM. For purposes of illustrating the scheme, the area chosen to store the two records ws located at addresses 3000 through 303C. The first address 3000 was assigned in Line 10. When you protect your own BASIC programs, you should (by appropriately editing Line 10) make the assignment consistent with the memory available to accommodate 61 consecutive RAM locations. Line 20 stores at addresses 3000 through 302F an image of the hooks at 15E through 18D. Lines 30 through 50 along with Line 100 are concerned with generating and storing the short subroutine. The subroutine is stored at addresses 3030 through 303C immediately following the hook record. Line 60 appropriately alters the hook record to provide entry to the short subroutine.

When you have correctly typed the program of Listing 4, save it for future use in protecting BASIC programs.

The protection scheme will be illustrated by applying it to the short example program of Listing 5. Therefore, after running the program of Listing 4, erase it by means of the *NEW* command. Then type Listing 5.

After typing the latter program, *CLOADM Link*. The responses to the *Link* prompts should be consecutively as follows:

PROBASIC
X
3000
302F
15E
N
3030
303C
3030
N
X
Y

Then appropriately follow the tape positioning and recording prompts. In the positioning process note the recorder counter setting for *PROBASIC*.

To test the protection scheme turn your computer off and then on again. Then load *PROBASIC* using *CLOADM*. When *PROBASIC* is loaded, it should request the typing of your name. The program will then go into a loop. You can stop it by pressing ENTER, BREAK or Reset. Regardless of how you stop *PROBASIC*, typing and entering any BASIC command of your choice will cause the computer to hang up.

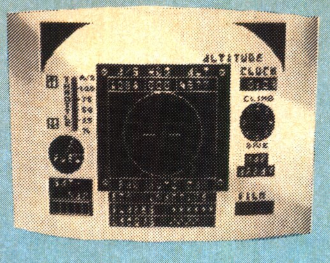
Link and the protection schemes were developed for your personal use. If you should wish to employ them commercially, please get in touch with me via THE RAINBOW to discuss mutually agreeable royalty terms.

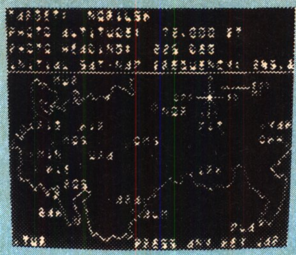
Listing 4:

```
10 CLS:A=&H3000
20 FORI=0TO47:POKEI+A,PEEK(I+&H1
5E):NEXT
30 FORI=0TO10:READD$:D=VAL("&H"+
D$):B=B+D:POKEI+A+48,D:NEXT
40 IFB<>977THENPRINT"DATA ERROR"
:STOP
50 FORI=0TO1:POKEI+A+59,PEEK(I+&
H168):NEXT
60 C=INT(A/256):POKEA+10,C:POKEA
+11,&H30+A-256*C
100 DATA 34,2,96,A6,81,6,25,FE,3
5,2,7E
```

Listing 5:

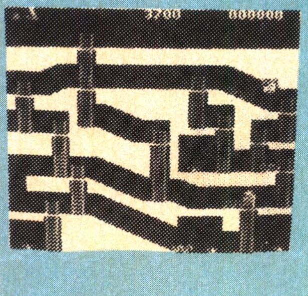
```
10 CLS:PRINT@226,"TYPE YOUR NAME
 & PRESS ENTER":PRINT@260,"";
20 LINEINPUTA$
30 PRINT@358,"PRESS ENTER TO STO
P"
40 K$=INKEY$:IFK$<>CHR$(13)THEN4
0ELSESTOP
```





SR-71

SR-71 is a fast action game in which you are the pilot on a mission to take photographs of missile sites in Russia and deliver them to our processing laboratory in Japan. So real you will feel as if you are in the cockpit on a real spy mission. Elude Russian missiles as well as their detection devices. Another Tom Mix exclusive. A must for the adventurous. Fantastic graphics, color and sound. **32K Ext. Basic** **TAPE $28.95** **DISK $31.95**



KING TUT

Journey through the caverns of King Tut's tomb. You are on a quest to find treasurers hidden in the caverns below. You light your way with only a small candle that grows dimmer as time passes. Watch out for the snakes and the ghost of King Tut himself. Five screens challenge your abilities every step of the way. Joysticks required.

16K MACHINE LANGUAGE
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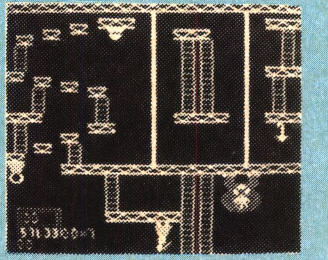
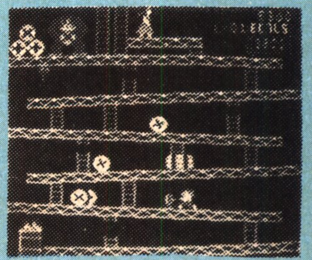
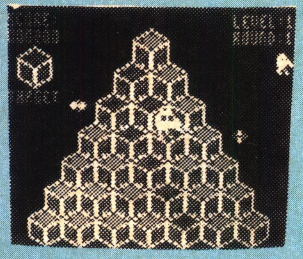




THE KING

This game contains all 4 full graphic screens like the popular arcade game. Exciting sound and realistic graphics. Never before has the color computer seen a game like this. Early reviews say simply outstanding. **JOYSTICKS REQUIRED**

32K MACHINE LANGUAGE
TAPE $26.95 **DISK $29.95**



CU ★BER

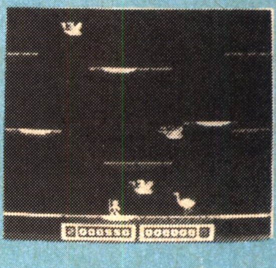
Approaches the excitement and challenges of any Video Arcade. The hazards of CU★BER are many. Help CU★BER change the colors on the pyramid while avoiding many of the dangers always present. Vipers, the Nurd, the Dork, bonus points all add up to another exciting release from Tom Mix Software.

32K MACHINE LANGUAGE TAPE $27.95 **DISK $30.95**

BUZZARD BAIT

We've done it again. You thought The King was great? Wait till you see this! Outstanding high resolution graphics, tremendous sound make this "joust" type game a must for your software collection. As you fly from cloud to cloud you will enjoy sky high excitement dealing with the challenges presented to you by this newest release by Tom Mix Software. Joysticks required.

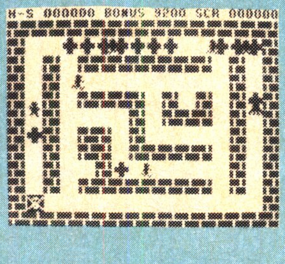
32K MACHINE LANGUAGE
TAPE $27.95 **DISK $30.95**



FANGMAN

Fangman is a high-resolution graphics arcade-type game based on the Dracula legend. Plot of Game: You're Dracula in your castle, stalking through a labrynth of passages in search of invading villagers seeking to destroy you by blocking your every path with deadly crosses. Their ally the Sun also wanders your halls, trying to touch you and turn you to bones and dust. Fortunately, you have allies of your own, your vampire bats who chase down the villagers, holding them till you arrive. Joysticks required.

16K MACHINE LANGUAGE
TAPE $24.95 **DISK $27.95**



HERE IS A GREAT UTILITY PROGRAM

SCREEN PRINT ROUTINE Prints contents of your graphic screen to an Epson, Microline or Radio Shack DMP Printers. Prints positive or reverse format. Horizontal or vertical, small and large printout. Print left, right, or center of page. Specify printer when ordering. **TAPE $19.95** **DISK $21.95**

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16K MACHINE LANGUAGE **TAPE $17.95** **DISK $21.95**

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Repairs crashed disks.
16K DISK $49.95 Lowercase displays not available with this program.

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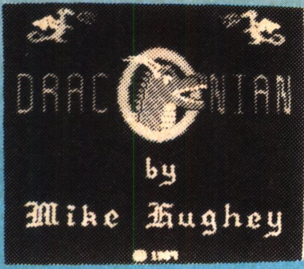

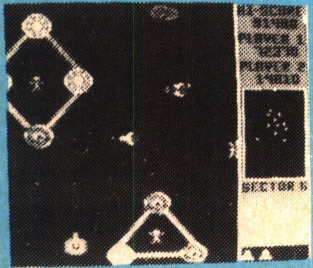

DRACONIAN

You brace yourself as your ship materializes in the enemy sector. Your engine roars to life, and you consult the long-range scanner for the position of the nearest enemy base. As you head for the base, blasting asteroids and space-mines in your path, you suddenly notice a monstrous space-dragon looming before you. Reacting quickly, you dodge his deadly fire-breath and blast him out of existence.

Finally, the enemy base comes into view. Avoiding the enemy fire, you destroy the gun turrets one by one with your rapid-fire torpedoes. Then, with the explosions still echoing around you, you rescue the astronaut who was being held prisoner by the enemy. Your mission is far from over, however, as there are more bases to destroy and more astronauts to rescue before the sector will be secured. And all must be done quickly; if you are too slow, the invincible DRACONIAN will surely seek you out as its next victim.

This is it — the single most impressive, awe-inspiring arcade game you can buy for your Color Computer. High-resolution graphics, awesome sound effects, four-voice music, and quality you have to see to believe! Experience the realism of DRACONIAN today!

JOYSTICKS REQUIRED

32K MACHINE LANGUAGE

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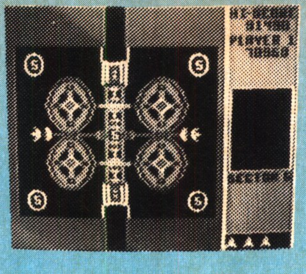
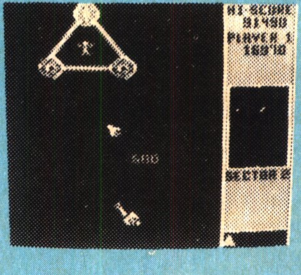
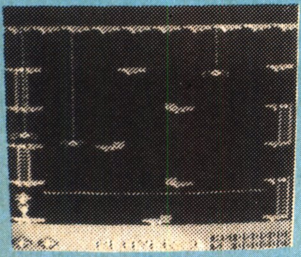






CRASH

This game is a high resolution Machine Language program with outstanding Arcade type graphics. The game consists of 4 screens. Fly the airplane over and through obstacles. Piloted by "Mario" who also appeard in "The King". The object is to conquer one screen after another but don't "Crash". Great fun for the whole family. For 1 or 2 players. Uses joysticks.

32K MACHINE LANGUAGE

TAPE $24.95 **DISK $27.95**

CHAMBERS

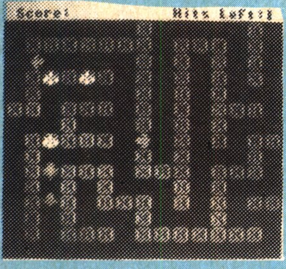
Exciting high resolution graphics game. Multiple screens. Outstanding sound, Chambers is loosely based on Cosmic Chasm. The object in each level is to destroy all of the evil creatures in each room and then go into the main reactor room and blow up the base.

JOYSTICKS REQUIRED

32K MACHINE LANGUAGE

TAPE $24.95 **DISK $27.95**

100
MEN
CHAMBERS
TOM MIX



WAREHOUSE MUTANTS

Journey through the warehouse seeking out the Mutants who are out to destroy you. WATCH OUT! They will push crates trying to crush you! Outstanding realism—high resolution graphics—multiple screens.

JOYSTICKS REQUIRED

16K MACH. LANGUAGE

TAPE $24.95

DISK $27.95

QUIX

This one is after a popular arcade game with a similar name. Simply frustrating—you'll love it. Done in high resolution graphics with Super Sound.

JOYSTICKS REQUIRED

32K MACH. LANGUAGE

TAPE $24.95

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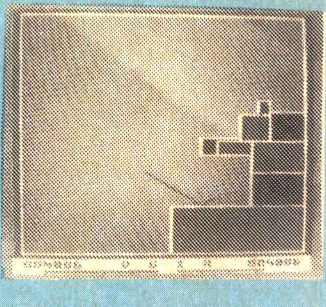
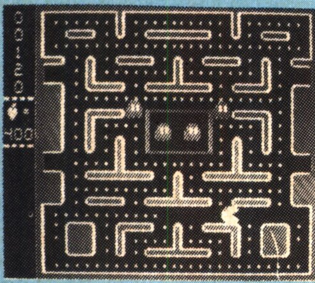




MS. MAZE

MS. MAZE is remarkable in that it combines brilliant color, high resolution, detailed graphics, and music with a very playable game. Anything that could be done to make the Color Computer look and play like the arcade version has been done. MS. MAZE is without question the closest thing to the arcade Pac games that I have seen for the Coco.

JOYSTICKS REQUIRED

32K MACHINE LANGUAGE

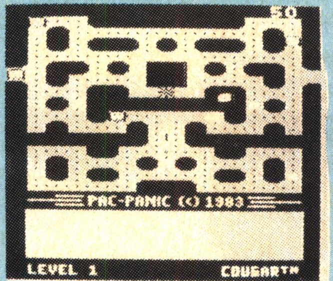
TAPE $24.95 **DISK $27.95**

PAK-PANIC

Pakman is steered thru a maze eating dots and powerpills. Pakman is pursued by four monsters who try to catch and kill him. If Pakman eats a powerpill he becomes powerful and can eat monsters. Monsters try to avoid a powerful Pakman. As monsters are eaten their ghosts appear on the top of the screen. When seven ghosts have appeared one will fly across the screen or they will link together forming a centipede that will travel thru the maze. Pakman has no power against ghosts and centipedes and must avoid them or be killed. **JOYSTICKS REQUIRED**

32K MACHINE LANGUAGE

TAPE $24.95 **DISK $27.95**



PAK TWINS BOTH MS. MAZE & PAK PANIC FOR ONLY **44.90 TAPE** **50.90 DISK**

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QUALITY EDUCATIONAL SOFTWARE

VOCABULARY MANAGEMENT SYSTEM

16K Extended basic/32K for printer output

The Vocabulary Management System (VMS) is a series of programs designed to aid a parent or teacher in helping children to learn and practice using vocabulary and spelling words. The 11 programs that comprise the VMS include a full feature data entry/edit program, three printer output programs and 5 vocabulary/spelling game programs. The system's many outstanding features include:

—As many as 300 vocabulary words and definitions may be in the computer's memory at one time.

—Words and definitions may be saved on disk or tape.

—Remarks and/or comments can be saved with word files.

—A disk loading menu allows students to load disk files without typing file names.

—Word lists may be quickly alphabetized.

—The three printer segments allow you to create and print individualized tests, puzzles, word-searches and worksheets.

TAPE $39.95 DISK $42.95

—The printer segments allow full use of your printer's special features.

—The 5 game programs are based on sound educational principles and provide practice in identifying words and matching them with their definitions in a fást-paced set of activities.

FRACTIONS - A Three Program Package - 32 K EXT. BASIC TAPE $30.95 DISK $35.95

MIXED & IMPROPER

1. Review converting mixed numerals and improper fractions.
2. Practice converting mixed numerals to improper fractions.
3. Practice converting improper fractions to mixed numerals.
4. Practice of both types. (Mixed to improper & improper to mixed)
5. Review converting mixed numerals to mixed numerals. (Used in regrouping in substraction)
6. Practice converting mixed numerals to mixed numerals.

EQUIVALENCE

1. Definitions of terms and review of finding equivalent fractions.
2. Practice finding equivalent fractions.
3. Practice finding sets of equivalent fractions.
4. Review of finding if one fraction is equal to, not equal to, less than or greater than another.
5. Practice finding if one fraction is equal to, not equal to, less than or greater than another.

LOWEST TERMS

1. Review of placing fractions into lowest terms by finding the greatest common factor (GCF) of the numerator and denominator.
2. Practice finding the GCF of pairs of numbers.
3. Practice placing fractions into lowest terms by finding the GCF of the numerator and denominator.

TEACHER'S DATABASE

TEACHER'S DATABASE is a program designed to allow a teacher to keep a computerized file of information about his/her students. There are many features that make this program particularly attractive:

- Information on as many as 100 students (or more) may be in the computer at one time.
- Each student may have as many as 20 (or more) individual items of data in his/her record.
- The program will run from cassette or disk.
- Cassette and disk files are completely compatible.
- The program is menu driven.
- Records may be easily changed, deleted, combined or added.
- Information about students may be numerical or text.
- Records may be quickly alphabetized.
- Records may be sorted by various criteria.
- Records may be reordered (ranked) based on test scores or other data.
- Data displayed during a sort may be printed on a printer or saved on disk or cassette as a new file.
- A full statistical analysis of data may be done and sent to the printer.
- Student test scores may be weighted.

REQURES 32K EXT. BASIC
TAPE $39.95 DISK $42.95

MATH DUEL

MATH DUEL is a challenging mathematics game that pits you against the computer it a game of wits. You must use all of your knowledge of factors, multiples and prime numbers to develop a strategy that allows you to gather more numbers and thus more points that than the computer.

The game is deceptively simple. You select the size of the playing field that is composed of from 8 to 100 numbers. You must then choose numbers that will give you the maximum number of points and the computer the least number of points. There are only 6 rules.

1. Any number that you chose must have at least one factor still on the playing field.
2. You receive points equal to the face value of the number that you chose.
3. The computer receives points equal to the face value of all of the remaining factors of the number that you chose.
4. All of the numbers that were awarded to you or to the computer are removed from the field.
5. The game continues until there are no numbers with factors remaining.
6. At the end the computer receives points equal to the value of all of the remaining numbers.

32K EXT. BASIC TAPE $24.95 DISK $29.95

ESTIMATE

ESTIMATE is a program designed to help children to practice estimating the answers to addition, subtraction, multiplication and division problems on the Color Computer. it has many features that make its use particularly attractive.

- Up to 5 students may use the program at the same time.
- There are 5, user modifiable, skill levels.
- The acceptable percent error may be changed as a student's skill improves.
- A timer measures the number of seconds used to answer each problem and the total time used for a series of problems.
- If a problem has been answered incorrectly, the student is told the percent error and asked to try again.
- If a problem is answered incorrectly a second time, the student is told the correct answer and the range of acceptable answers is displayed.
- A report is given at the end of each set of problems that includes the number of problems done, the number of problems answered correctly on the first try and the average percent error.
- The (BREAK) key has been disabled so that child will not inadvertently stop the program from running. **REQUIRES 16K EXT. BASIC**

TAPE $19.95 DISK $22.95

PRE-ALGEBRA I INTEGERS

INTEGERS is a series of four programs designed to give students practice in working with addition, subtraction, multiplication, division and the comparison of integers. It has many features that make a very valuable tool for introducing and/or maintaining skills.

- Up to 4 students may use the program at the same time.
- There are 9, user modifiable, skill levels.
- Students are given two opportunities to answer a problem.
- A detailed report of student performance, including number correct on first try, number wrong, total time used and percentage score, is presented at the end of a series of problems.
- The programs will run on a 16K TRS-80 Color Computer with or without disk drive.

Four distinct problem formats are presented. The first presents problems in this format: $-12 + -9 = ?$ The second program presents a problem with missing numerals in this format: $-7 - ? = 18$. The third program presents a problem with a missing sign: $8 - ?6 = 14$. The last program asks the student to determine the relationship (=, ◄ or ►) between two statements $3 -9$ (??) $-4 -5$.

32K EXT. BASIC
TAPE $28.95 DISK $33.95

PRE-ALGEBRA II

The second **PRE-ALGEBRA PACK** is composed of two programs, EQUATION SOLVER AND EQUATION DUEL, that are designed to give students practice in using and solving equations. It has many features that make a very valuable tool for introducing and/or maintaining skills:

- In both programs students may choose the range of numerical values that will be included in the equations so that the difficulty may change as their skill increases.
- In EQUATION SOLVER the computer secretely generates a random equation, shows the numbers that it used in the equation and the answer and challenges the student to create his/her own equation that uses the same numbers and results in the same answer.
- In EQUATION DUEL the student and the computer race to see who will be the first to create an equation from the same set of random numbers.
- Both programs give detailed reports of the student's and the computer's performance in creating and solving equations including time used, score and percentage correct.

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TURN OF THE SCREW

An Introduction To The Inside Of The CoCo 2

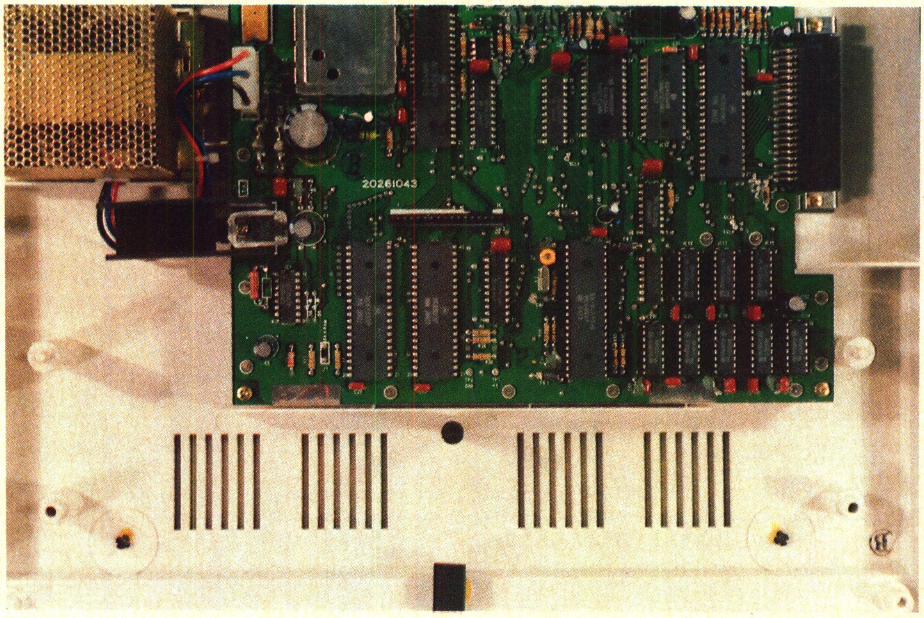
Editor's Note: A correction to the wiring instructions and the BASIC listing for last month's column appear on Page 226 of this issue.

By Tony DiStefano
Rainbow Contributing Editor

My, doesn't time go fast? I can't believe I've been writing for RAINBOW for two years now.

January being THE RAINBOW's Beginners issue, I decided to introduce the novice to the inside world of the Color Computer. The latest CoCo 2 is the newest Color Computer to be introduced by Tandy. It is different inside from the old CoCo 2. You can tell the difference by the shield covering the power transformer. Though it functions the same, the insides of this CoCo are very different (again!). More on that later.

Before we get on our way, let me mention that I just came back from my second RAINBOWfest. I must say that these shows are great. I found THE RAINBOW staff to be very friendly and helpful. It is amazing to see that much enthusiasm generated about the Color Computer. Chances are I'll see some of you at the next RAINBOWfest, too, in California. Stop in and say hello. Look for me at the R.G.S. Micro booth.



Now, let's look into this little thing, but remember, opening your computer might void your warranty. Radio Shack only warranties the computer for three months, so after that you are on your own, anyway. First of all, *never* open the computer with the power on. Now that that's said, let us continue.

To open your CoCo, use the following procedure. Place the computer upside down on a towel (or other soft surface) on a clean work table. Remove the four screws (one in each corner) with a medium-sized Phillips screwdriver. There is one more screw to remove; it is behind the little sticker that says "Opening case will void warranty. See owner's manual for warranty informa-

---

(Tony DiStefano is well known as an early specialist in Color Computer hardware projects. He is one of the acknowledged experts on the "insides" of CoCo.)

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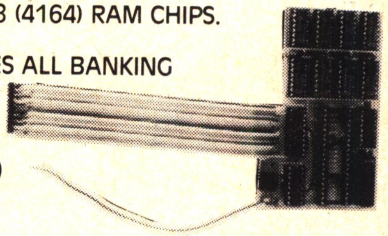

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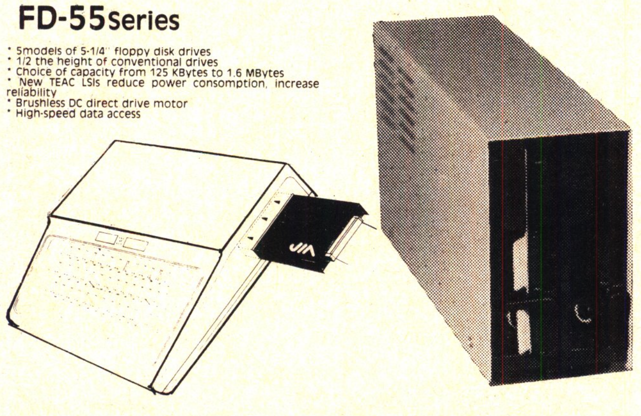

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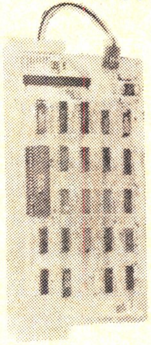

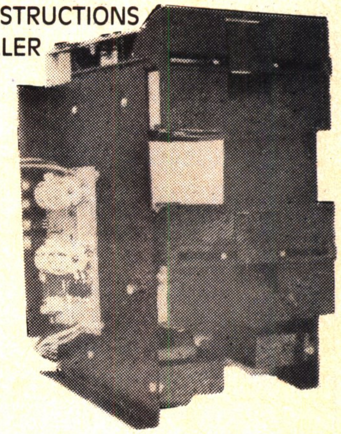

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TERMS: VISA - MASTER CARD - AMERICAN EXPRESS —— **HOURS:** MONDAY - SATURDAY 10:00 AM - 6:00 PM tion." You must break this seal to remove the last screw. That is how Radio Shack can tell if you have opened it. Just push the screwdriver through the center of the sticker; it will give way to a hole. Some of the CoCo 2s may have a sixth screw on the other side. Remove the last screw. Turn the computer back right side up, and gather up the screws that drop out. Grab the top cover of the computer and pull it off. Wow! Look at all those things. The components marked with the letter 'U' (or 'IC' in the case of the newest CoCo) are known as ICs (Integrated Circuits). Table 1 labels all the ICs used in the computer and gives a short description of each.

Figure 1

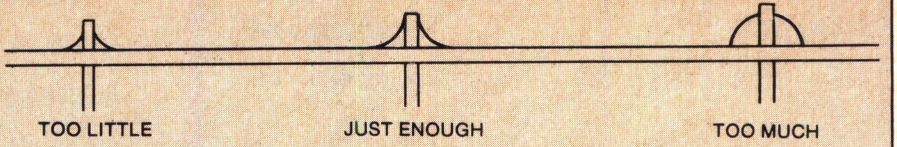

TABLE 1

IC #	Name	Description
1	SC77527	SALT Power supply and RS-232 CHIP
2	MC6821P	PIA Peripheral interface adapter
3	SC77526	DAC Digital to analog converter
4	NE555D	Timer for color burst in *PMODE* 4
5	74LS273	Octal D-Type Flip-flop
6	74LS244	Octal Buffer Driver
7	SC67331P	IIA Industrial interface adapter
8	MC6847P	VDG Video Display Generator
9	MC6809EP	CPU Central Processing Unit.
10	74LS02	Quad 2-input Nor Gate
11	74LS138	3 to 8 Decoder Chip
12	8040364B	ROM BASIC 1.2
13	8042364A	ROM EX BASIC 1.1
14-21	8040517	16K DRAM Dynamic Random Access Memory
22	MC6883P	SAM Synchronous Address Multiplexer

Beginners Project Parts List

Quantity	Description	Radio Shack #
1	LED	276-068 or 276-069 or 276-073
1	RESISTOR 1k ohms	271-8023

Some of the components that make up the CoCo are very sensitive to static electricity. You must be careful not to zap (permanent damage caused by static discharge) a chip by touching the pins with your fingers. If you must touch a chip, always touch a ground point with your fingers first. This will discharge any static your body might be carrying to ground. A good ground point to touch is the RF adapter. That is the big metal can sitting to the left, where you plug in the TV wire. Another point is one of the metal clips that hold the bottom shield to the main PCB (Printed Circuit Board). You will find these clips all around the edge of the PCB.

Now that we have seen the insides of the CoCo and are a bit more familar with its parts, let's do something to it. About the simplest thing we can do is add a pilot light. It is not hard, and if you take it one step at a time, anyone will be able to do it, and the good thing about it is that it costs less than $1. By the way, this pilot light will work on any version, not just the CoCo 2. Before you plunge into this though, if you do not have any soldering experience, practice on something else first. To do this, you will need a soldering iron. A low power, medium or fine tip soldering iron will do. The solder to use must be a rosin core and not too thick. Radio Shack sells both at a reasonable price. If you have never handled a soldering iron before, get Radio Shack's proto-board and practice on it first.

Here are the step-by-step instructions on how to solder:

1) Make sure that your soldering tip is clean and hot. A wet sponge is great to clean the tip.
2) Secure the component to the PCB.
3) Heat the component and the PCB with the iron.
4) Touch the end of the solder to the component. My personal habit is to position the solder so that it will touch the iron, component and PCB at the same time.
5) When enough solder flows, remove the solder.
6) Remove the iron from the joint.
7) Wait until it cools before moving the component or the PCB.

To make a good joint takes practice. To put the right amount of solder also takes practice. Too much or too little could result in a bad connection. Examine Figure 1, and notice the difference between too little and too much solder. Sometimes a bad connection can be turned into a good connection just by heating up the joint again. After it cools, the joint should be shiny and smooth. Practice several times until you get the hang of it. There

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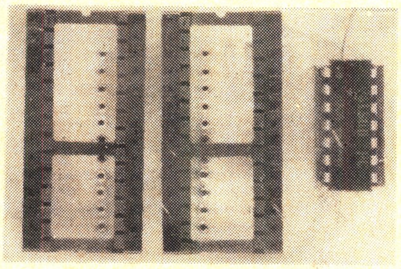

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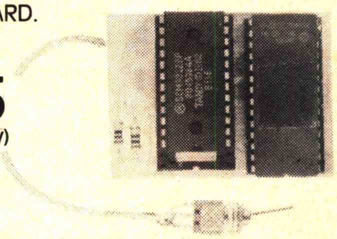

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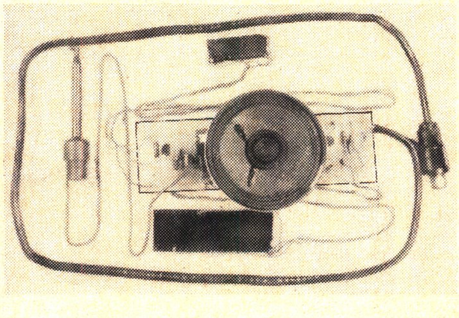

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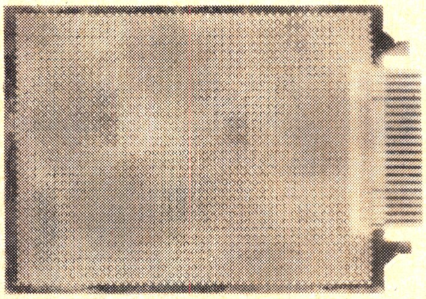

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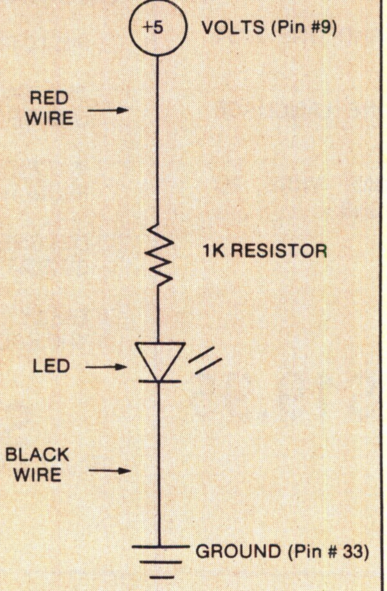
TERMS: VISA - MASTER CARD - AMERICAN EXPRESS —— **HOURS:** MONDAY - SATURDAY 10:00 AM - 6:00 PM is one more thing to remember; after all the soldering is done, clean the PCB with Radio Shack rosin cleaner-remover.

Now that you feel more at ease with soldering, it is time to put your newly acquired talent to work. Yes, the pilot light. There are only four parts to this project. The LED, a 1K (K=1000) ohm ½ watt resistor, and two short lengths of colored wire (preferably red and black). That is it. Examine the schematic in Figure 2. This is a diagram on how the components connect together and to the computer. The first thing to do is mount the LED. You must decide where to put it. After that, you must check that when mounted, it does not interfere with the normal operation of the computer, i.e., short out or lean on other components and does not prevent the cover from fitting properly.

Mount the LED by drilling a ¼-inch hole where the LED is to be mounted. Cut both sides of the resistor leads to about ¼ inch. Solder one side of the resistor to the long end of the LED. Solder one end of the red wire to the other end of the resistor. Solder one end of the black wire to the other (short) end of the LED. Twist the two wires together lightly and cut them about 18 inches long. This should be long enough to have the cover out of your way if ever you want to open the computer again.

Figure 2



Now, solder the other end of the red wire to inside of pin 9 of the edge connector. That is the five volts side. How do you get to pin 9? Simple, just start counting from the end closest to the back of the computer. All the top pins are odd numbered, so count 1, 3, 5, 7, 9. Make sure that you don't short out two pins with the solder. Finally, solder the black wire to pin 33, count that one the same way. Pin 33 is the ground return pin.

Place the cover on top of the computer (without the screws for now) and turn the computer on. The LED should turn on. If not, chances are that you got the wires to the LED reversed. In that case, unsolder the resistor and the black wire to the LED and resolder them the other way. Otherwise, you should not have any problems. Tuck the wire in the cover and place the cover back on. Make sure that the wire does not stick out and that the keyboard is sitting on the pegs properly. Turn the computer over and replace the screws. There you are, your first modification to your computer. Now doesn't that make your day?

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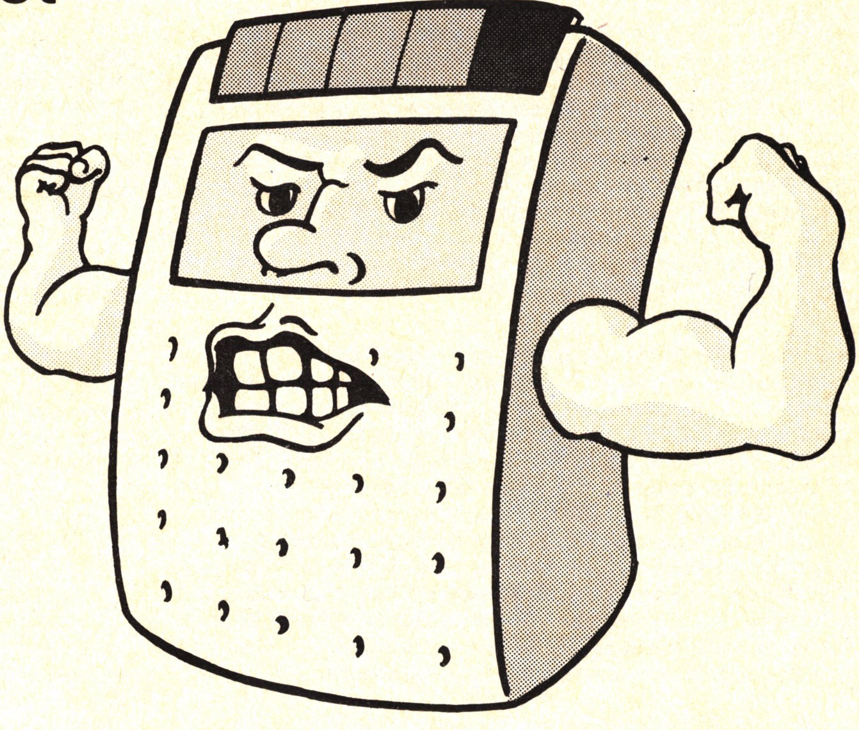
Getting The Most From Your Cassette Recorder



By Norman Latner

Choosing a cassette recorder is, all too often, a hasty afterthought following the exciting and carefully thought out purchase of the Color Computer. However, after encountering endless I/O Errors and spending what seems like ages searching for programs located somewhere on your tape, you'll know you should have thought about it more.

Fortunately, the situation is not hopeless. You *can* make reliable, consistently high quality recordings by improving your present tape recorder and using good recording techniques and materials. And, if you're in the market for a new and better cassette recorder, I'll discuss how you can choose the most suitable unit.

Cassette recording with the Color Computer has a lot going for it. At 1500 Baud, it's five times faster than many of its competitors, allowing it to record an 8K program in less than 45 seconds. It's reliable and inexpensive. A brand name 60-minute tape can be bought for about a dollar in large metropolitan areas. It can store an amazing 675K bytes, or about 4 $^1/_3$ times more than a $5 Radio Shack disk. And while the cassette recorder can't immediately access a program located anywhere on the tape, or read as fast as the disk unit does, you will be able to locate programs fairly quickly using cue/review, speaker mute override and remote override features, which I'll discuss later. As we further compare cassette to disk, we find that disks are far more prone to catastrophic failures. Don't ever turn the power switch off on a disk drive with a disk in place. Don't operate a drive in the presence of a strong RF field or any place where sparks from equipment turn-on might be close enough to disturb the unit. These disks may never again divulge their information to you. Disk drives can suddenly change from reading (playback) to writing (record) with no intervention on your part. The cassette unit, on the other hand, won't record unless you simultaneously press the Play and Record keys. And finally, a cassette recorder costs many times less than a disk system.

The Ideal Cassette Recorder

If you could get the ideal cassette recorder for use with the Color Computer, it wouild have the following features: cue/review keys, a remote override switch, a speaker mute override switch, a record monitor switch and a tape counter.

The value of the tape counter is fairly obvious. You can tabulate your programs by tape counter number and access them more quickly and accurately. By setting the counter to zero prior to a loading or saving operation, you can get back to the start of the program very easily if need be.

A record monitor switch, a feature available on a number of tape recorders, allows you to listen in while the recording is being made. Hearing the process can alert you to such

---

(Norm Latner, an electrical engineer, works in a government laboratory. He is involved in research and development of nuclear instruments, and is a frequent contributor to scientific journals.)

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problems as recording with the computer in the high speed mode, (the "start tones" will sound much higher pitched than usual) or trying to record after erroneously typing *CLOAD* (there won't be any sound). It's reassuring hearing the two characteristic start tones followed by the crisp, static-like sound of the program code.

A speaker mute override, which could do you a great deal of good, is just another way of saying the cassette recorder's speaker is able to operate even though the plug in the earphone jack has turned it off. (That plug, of course, normally goes to the computer and allows loading.) The ability to hear the tapes loading is one of the most important aids available to you. It allows you to identify problem tapes by their muffled, mushy or wavering sound quality. It alerts you to programs accidentally recorded in the high speed mode. It lets you easily find the gap between programs. By locating and starting at this gap, you eliminate all those I/O Errors which occur when you attempt to load in the middle of a record. In addition, when used with the cue/review feature mentioned below, you can even hear the programs in fast forward or reverse. This allows you to move quickly through the tape while keeping count of the programs you've passed through. You can, for example, locate a program five ahead of your tape's current position by counting the noisy, followed by quiet, sequences. While it's theoretically possible to use *AUDIOON* to hear the cassette output through the TV speaker, there are some practical problems. First, an I/O Error resets this command, thus requiring constant re-entry. Second, the computer can't be doing anything else at the time — you can't set up to read another program while the first is still running. However, the speaker mute override is completely independent of the computer. The only reasonably priced recorder with this feature so far is Radio Shack's new CCR-82. If you're electrically knowledgeable, or can get help from a friend who is, it's easy to add this feature to your present recorder. It takes one resistor added to your recorder, or if you'd rather, you can build a separate box which gives you this feature plus a remote override switch. Details to follow.

A remote override switch will save you untold wear on your connecting cable, remote plug and jack as well as your patience. The remote jack, which permits the cassette unit to be turned on and off by the computer, also prevents you from operating the cassette recorder manually. By temporarily defeating this lockout, you regain manual control and can locate the tape anywhere you wish using Fast Forward, Reverse or Play. I've installed a switch to do this in my recorder or you can build it into the box mentioned above.

The final feature that you ought to have is cue/review. Cue/review keys, which are available on a number of cassette recorders, ordinarily operate like the standard fast forward/rewind. However, unlike these keys, cue/review also operates when the Play button is depressed, allowing you to hear the tape while fast forwarding or rewinding. This makes it possible to listen while the tape moves quickly, and then stop in the gap between programs, thus eliminating the bulk of I/O Errors.

> ***"You can make reliable, consistently high quality recordings by improving your present tape recorder and using good recording techniques and materials . . . Cassette recording with the Color Computer has a lot going for it."***

And while we're talking about features of the ideal cassette recorder, we might add such niceties as a VU meter, or at the least, an LED, to indicate recording level. This helps you to arrive at the proper volume setting with a minimum of effort. A useful, but not essential feature is a linear slide volume control rather than the conventional rotary type. The setting of the linear control is obvious at a glance. End of tape-auto shut off is desirable, and by now, not too hard to get. However, be careful when using this, since the feature doesn't normally work in fast forward or rewind.

What You Can Buy . . . Or, The Realities Of The Marketplace

Now that we've talked about the ideal tape recorder, let's examine what's commercially available. The basic require-

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ments for a CoCo compatible recorder are remote and earphone jacks, aux or line or mic jack and six-volt operation. (A recorder that takes four cells is a six-volt type.) These features are available and you should have little trouble finding a unit which also has a tape counter and a recording indicator. Cue/review keys are available on the somewhat higher priced machines, some of which also offer linear slide pots. The next step up offers units which usually include an AM/FM radio (which you don't need), along with monitor and ALC switches (which you do need). It might take a little looking, but you can find the close to ideal recorder in several name brands, at larger stores.

Radio Shack had not made any great effort to tailor their recorders, both the CCR-81 and the now discontinued CTR-80, to the needs of the computer user. For the most part, they resembled standard audio cassette units. A few of the features we'd like are there while others, which could have been easily implemented, are missing. Both recorders allow remote override during fast forward and rewind, but not during play, and both have a recording LED and a counter. The CCR-81 has the cue/review feature missing in the earlier model. The newest addition to Radio Shack's cassette recorder line, the CCR-82, has this as well as remote override and monitor switches. Although the Radio Shack recorder represents one of the easiest choices, you can do much better if you're willing to spend the time and effort. Aim for the unit which offers as many of the desirable features as possible and fits within your budget. As a final note, avoid like the plague, a cassette recorder which has single button recording rather than the standard type which must have both Play and Record keys depressed together. It's all too easy to slip up and destroy your favorite programs.

Improve Your Present Recorder

For those of you who want to improve your present recorder, the speaker mute and remote override functions can be added, and I'll describe how you can do it. While it's possible to add a recording monitor switch to most recorders, it's a lot more complicated and generally requires a schematic diagram, which puts it beyond the scope of this article.

There are two approaches to implementing the speaker mute and remote overrides, depending on your ambition and technical skill. In either case, you have to be able to solder, drill holes and otherwise work at a simple project level. If that's beyond you, or you can't get a technically inclined friend to help, then just skip to the next section.

The easier construction method consists of building a separate box which houses a small loud speaker, a switch, a resistor, two jacks and two plugs on short cables. A wiring diagram and suggested parts list are shown in Figure 1. There's nothing critical here, including parts layout. The switch can be any momentary type or, even better, a toggle switch with a center off, one side on, and the other side momentary. This arrangement frees you from keeping the switch held down during such chores as rewinding a tape. If you use this type of switch, connect the two outside lugs together and use this as one lead, with the center lug as the other. Another option you could consider is installing a foot operated switch, such as Radio Shack #44-610, at the end of a six-foot cable. This frees your hands entirely.

The particular value of the resistor (47-120 ohms) can be chosen to give a sound level that suits you. If yours is a quiet environment, you may want to use a value even higher than 120 ohms. To get the greatest flexibility, you could install a 500 ohm potentiometer in series with a 47 ohm resistor, allowing you to vary the volume as the need arises. While you can raise the resistance without problems, don't lower it much below 47 ohms, since this will decrease the signal available to the computer. Resistor tolerance, indicated by a gold or silver band, is unimportant in this application — use whatever you can get.

An important point to note is that you can't mount both jacks on a metal surface. The bushing of each jack is tied to one of its contacts, and this would short one jack to the other

PARTS LIST

PROJECT CASE	RADIO SHACK #270-221 or 222 or 233
2" SPEAKER	RS 40-245
1/8" MIN PHONE PLUG	RS 274-286
3/32" SUBMIN PHONE PLUG	RS 274-290
1/8" MIN PHONE JACK	RS 274-251
3/32" SUBMIN PHONE JACK	RS 274-292
RESISTOR	1/4 or 1/2 WATT 47 to 120 OHM (SEE TEXT)
WIRE	

Figure 1

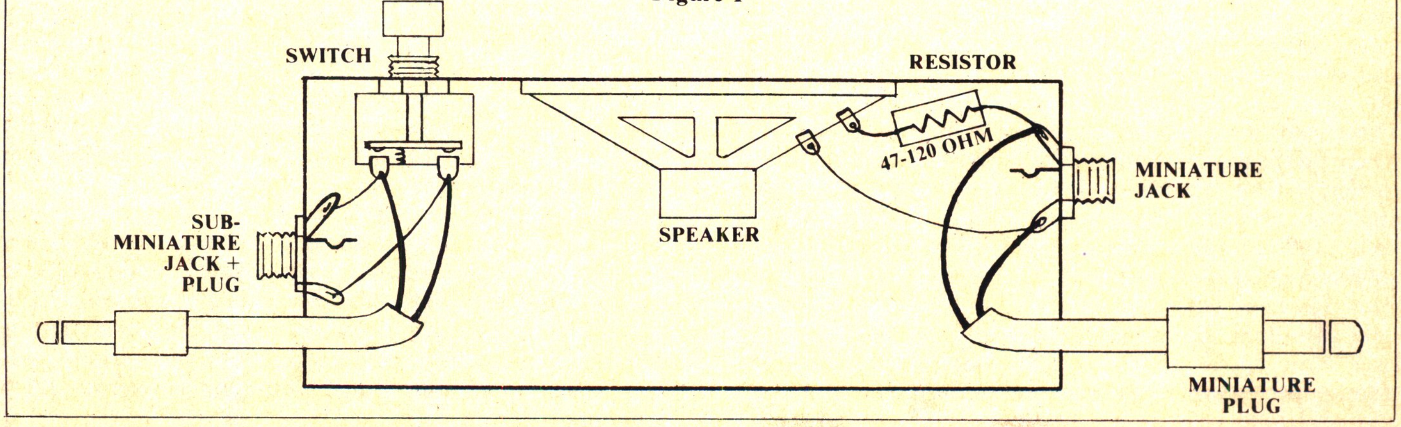
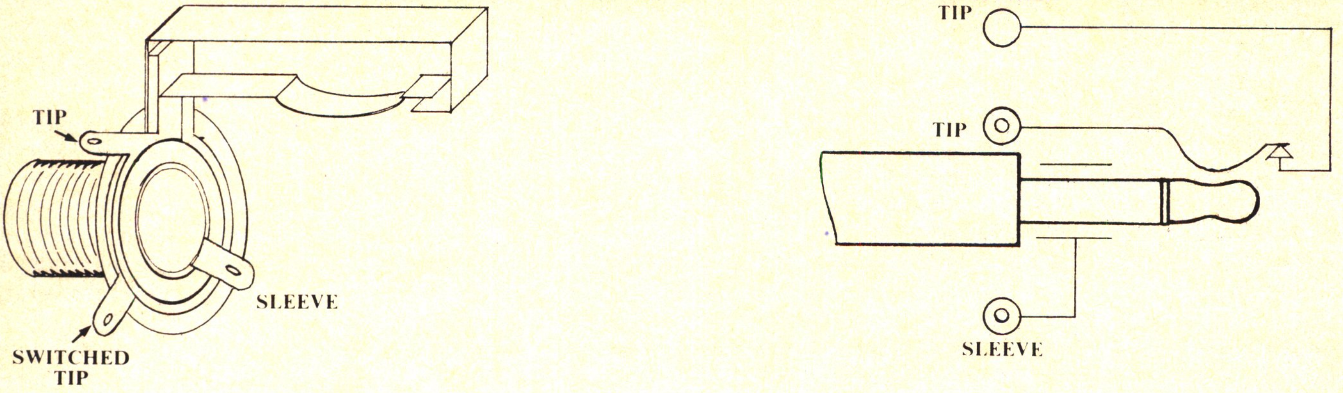


Figure 2



— a definite no-no. Pay particular attention to the connections on the jack. Although there are generally three solder lugs, you only use two — the "sleeve" and "tip" lugs. The "sleeve" is the one that's electrically connected to the mounting bushing, and the "tip" contact can be identified by inspection. The third contact, not used here, allows for switching. See Figure 2.

A very convenient solution for building this box is to use an old transistor radio. Almost everyone has an old, nonfunctioning radio in his basement or the top of the closet. Remove the innards, leaving the loudspeaker and the earphone jack, which might be either a miniature or subminiature type. Install a second jack, of the other type, in a hole you either drill or melt into the case. Make two holes for the cables and another for the switch. Solder all the connections as per Figure 1. Your original computer cable, except for the microphone (or aux or line) input which stays put, now plugs into the box you've made. The cables and plugs from the box, in turn, go to the tape recorder, and you're finished. You now can hear the tape as it loads into the computer and move or play the tape without pulling out the remote plug.

If you have the skill, a neater and more compact way of adding these features is to modify the recorder itself. First, carefully take the back cover off the recorder and put the screws in a small container. (Be sure to get the ones that are invariably hidden in the battery compartment.) At this point, the earphone and remote jacks should be visible. Sometimes they are on a subassembly, which might require loosening a few more screws. Now examine the earphone jack and locate the "tip" and "switched" contact. See Figure 2. Solder the resistor to these points without removing any of the leads already attached. If the jacks are attached to the printed circuit board, trace the leads and solder the resistor to the appropriate pads on the board. Now locate the tip and sleeve contacts on the subminiature, remote jack. In this case, you connect two leads rather than the resistor. These leads go to the switch, which will be installed somewhere on the case, or you can use the foot switch mentioned earlier, instead. Almost any kind of small switch can be used and you can locate it anywhere you can find the room in your tape recorder. Around the battery compartment is usually a good spot, since battery operation with the computer is unnecessary and undesirable. Drill the mounting hole, install the switch, solder the leads and reassemble the case. Now you're all set to hear your programs playing through the recorder's speaker and to override the computer's control by operating your switch.

Making The Best Possible Recordings

To make a good tape recording, you need a good tape. Not only does the magnetic tape have to be uniform and of good quality, but just as important is the tape transport mechanism within the cassette. Poor corner guide rollers or none at all, ineffective anti-friction sheets, non-rigid cases, and poorly made center hubs that do not turn freely can cause tape jams, uneven spooling and tape binding. Magnetic tape problems usually result from non-uniform oxide coating and can cause dropouts and varying volume. All of this translates into I/O Errors and headaches. Fortunately, these problems can be avoided by buying name brand audio tapes or shorter computer tapes available from reputable dealers. The 60-minute audio tape is relatively inexpensive and a good size to use. The 90-minute tape can also be used, but avoid the 120-minute or longer sizes, since these tapes are thinner and more susceptible to stretching and breaking.

The cassette tape you end up with should have a case which doesn't deflect with moderate finger pressure; the window area near its hubs should be of rigid clear plastic, not thin film; the hubs should move freely when turned with a pen. If the case is transparent, you should see corner guide rollers, preferably set on metal pins. The pressure pad, which holds the tape against the head, should be made of felt rather than sponge rubber, which deteriorates with age. And finally, the case should be held together with screws rather than glue to facilitate repairs if needed.

If you're reusing a tape, it's best to bulk erase it before recording. Bulk erasing reduces the noise level below the recorder's own erase head level. If that's not possible, at least erase it as a separate step prior to use. Put it into your recorder or tape deck, lower the volume to minimum, the ALC to 'Off' if possible, and set the unit to 'Record.' This method assures a clean tape.

Don't neglect periodic maintenance of your cassette recorder. Clean the record and erase heads, as well as the pinch roller and capstan, using readily available head cleaner fluid and swabs. Solvent grade alcohol, which contains little or no water, can also be used, but avoid rubbing alcohol which is 30 percent water. If you can see any oxide deposits on your tape heads, your unit is overdue for a cleaning.

Demagnetizing the tape head is also a good idea and is recommended after every 10 to 15 hours of machine use. A magnetic bias on the head will cause an increase in noise level and a loss of high frequency response which can cause I/O Errors. Relatively inexpensive demagnitizers are available, including a very easy to use unit built into a cassette case. You simply insert it as you would any cassette, and then set the recorder on play for a few seconds.

Automatic level control (ALC) is a mixed blessing. It relieves you of the burden of setting the recording volume, but it has some disadvantages. It takes about one-half second to operate, causing a sudden change in the volume of the starting tones at the beginning of each record. In addition, the setting it chooses may not be the optimum one. It's a compromise, but one that you can live with. However, if it's possible to switch the ALC off, do so for the best recordings.

At this point, if your recorder doesn't have ALC, you'll need to determine the optimum volume control setting for recording. In general, the best results can be obtained by setting the level to record as high as possible with only occasional excursions into the overload region. This can be seen on the VU meter or recording LED if you have one. Without any indicator, you'll have to use a trial and error method. Start by setting the volume control to an arbitrary point, say three-quarters of the way up, and *CSAVE* a program. Next, remove the cassette and play the program back on a stereo tape deck (yours or a friend's). Watch the VU meters, or better yet, the dual series of LEDs, standard on newer decks. See if the recorded level is generally high, just below or occasionally going into the overload (red LED's) region. If so, you've been recording at the right level, otherwise, make corrections and repeat the procedure until it's right. It doesn't take long. Once you've got the correct setting, mark the position with a dab of nail polish or paint, and always record at this setting.

While you're at it, you can also check your tape tracking. The cassette recorder used with your computer is monophonic and lays down a wide track which spans both the left and right channel tracks recorded by a stereo tape deck. Thus, when you play a monophonic tape on a stereo deck, the left and right VU or LED indicators should show an equal response if all is well. (Editor's Note: Many mono recorders normally record their single track off-center compared to the usual stereo track positions, so there can be as much as 3 dB of difference between the left and right channels when playing the tape on a stereo machine. In a few cases, you may be able to adjust head height to cure this problem, though it shouldn't have any ill effect when using the recorder with a computer.) If one side is noticeably different from the other, you have a problem. The cause could simply be due to oxide deposits on the recording head and easily cured by cleaning, or it could be due to misalignment of the recording head. This latter problem is sometimes spotted when a friend tries to read one of your tapes. Your tape, though it works well for you, gives him I/O Errors, and when heard on a good audio system has a mushy, wavering quality. You won't notice it because the error is present in both your recording and playback and thus tends to cancel out. However, this makes it difficult to share programs with friends. If you're technically inclined, you can readjust the alignment, otherwise get help (and skip the next paragraph).

The cassette head assembly generally has an azimuth

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adjusting screw at one end, while the other end acts primarily as a pivot. The screw is usually accessible from the outside of the case, so you don't have to dismantle the unit. There is an access hole located between the operating keys and the cassette space, at the left side of the head mechanism. It is often covered by a plastic plug or label of some sort. The adjustment is made with the cassette unit playing a tape of known good quality, such as a selection recorded on a good tape deck known to be in alignment. Using a small Phillips screwdriver inserted through the access hole, adjust to get the cleanest, least distorted sound. When you think you've got it, make a recording and recheck it on the stereo tape deck for final verification.

Some cassette recorders have tone controls. If yours has one, set it to the highest (brightest) position when used with the computer.

Although your own preferences should guide you, I find it best to leave a tape gap of four to five seconds between programs. With this length gap, you can usually rerecord a program in the same location after correcting the inevitable bugs. If the blank region is too short, it makes it difficult to locate the gap when searching through the tape. On the other hand, too long a gap makes it hard to tell whether it's really a gap or the end of the recorded area on your tape. This can lead to recording over, and thus destroying, one or more of your programs. To further safeguard your valuable programs, always punch out and remove the erasure prevention lug on the top left edge of the cassette after you've finished recording a side. You can always rerecord, if necessary, by putting tape over the opening.

Though not as critical as the recording level, the playback volume setting can also be optimized for more reliable loading. Generally, there is a range over which you can get satisfactory results. Below this range, programs won't read in, while above, the computer will trip on noise and you may even hear sound breaking through the TV without *AUDIOON*. To define the range and then locate the best operating point, start at a low volume setting and try to read in a program. If this is too low, the steady 'S' at the top of the screen won't change. Raise the volume until you see the blinking 'F' when loading. This point, which you should temporarily mark with a spot of tape, is the minimum playback level. Now keep raising the volume until the computer responds to noise, either in the gap between programs or on a blank tape. At this level, the screen shows a reversed 'S.' Temporarily mark this maximum position. While the best place to operate within the range is the center, it's very convenient to use the recording setting if it's not too far off. Just leave the control at that point for both recording and playback. If you're not that lucky, paint another mark for the playback point and readjust between playback and recording when necessary.

Finally, a few hints on handling and storing tape are in order. Always avoid touching the tape with your fingers, since doing so might cause dropouts which can generate I/O Errors. When not in use, keep the cassette in its plastic case to protect it from dust and damage. Avoid prolonged exposure to temperatures above 110 degrees Fahrenheit, direct sunlight, high humidity and strong magnetic fields. Don't store them near heating appliances, TV sets or similar equipment.

Armed, as I hope you now are, go forth into the world of perfect recording.

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An Open-Ended Exploration

By Joseph Kolar
Rainbow Contributing Editor

The more you learn, the more you realize how little you know. That is true as far as the CoCo is concerned, and that is why every session at the keyboard is an adventure in learning.

The new CoCo owner bought his versatile machine for its graphics capabilities, among other things. We will explore the *POKE* and *PEEK* BASIC Statements as they apply to the text screen page.

I can't be sure what we'll do, but fire up CoCo and let us proceed line by line and investigate whatever comes to mind. It is a good, open-end way to learn and still have fun.

The text screen is what you see when you turn on the CoCo. It is your working area. *PRINT@* locations 0 to 511 cover all 512 locations on the text screen. Key in:

```
1 CLS
10 PRINT@ 10, CHR$(128)
100 GOTO 100
```

Line 10 tells CoCo to print at the eleventh space of the top row, a black square. This is due to the first upper left-hand location being designated as 0. To verify that this is so, add and *RUN:*

```
11 PRINT@0,“12334567890”;
```

Don't forget to add the semicolon. Now, delete the semicolon and see what happens. To help yourself learn, say to yourself, “Having deleted or omitted the semicolon, the black block, *CHR$(128)*, vanished. When the semicolon was restored, the black box was visible. So, what have I discovered?”

Insert an apostrophe or *REM* marker in front of ‘P’ in Line 11 and insert Line 9, copying the information in Line 11 ending with a semicolon. *RUN* and observe. Press BREAK, then delete the semicolon in Line 9 and *RUN*.

BREAK places the apostrophe (') marker in front of ‘P’ in Line 9. Delete the apostrophe in Line 11 and recheck both with and without the apostrophe.

You should have noticed that when Line 9 precedes Line 10, it is not necessary to add the semicolon. However, if you placed the information in Line 9 following Line 10, it is a different story! It is left to you to mull it over in your mind and figure out why this is so. There is no better way for a beginner to learn something than to work it out for himself.

When you are finished, you may *DEL9*, or if you prefer, keep it as a *REM* line in your program. It is harmless.

Please note that using *PRINT@* allows you to print a string of characters, such as ‘RAINBOW’ when enclosed in quote marks and separated from the location value by a comma. You can print the ASCII character codes using *CHR$(x)*. The characters from 128 through 255 will create block graphics.

If you are unfamiliar with these graphics blocks, key in the following routine:

```
5 GOTO 200.
```

This line gets us around our routine, which we will refer to later.

```
200 FOR X=128 TO 255
210 PRINT@240, CHR$(X)
220 FOR Z =1 TO 200: NEXT
250 NEXT X
299 GOTO 299
```

(Joseph Kolar is a free-lance writer and programmer dedicated to proselytizing for computers in general, and the CoCo specifically.)

Each *CHR$* character from 128 through 255 will be printed, in rotation, in the middle of the display screen. Add:

```
211 PRINT@270,X
```

This will give the numerical value of each shape displayed. It will also help you visualize each shape which will be directly above the second digit.

If you want to see the other characters, change Line 200:

```
200 FOR X= 33 to 127
```

CHR$(32) is a blank space, creating a space just as the space bar does. The low numbers are control codes and do not generate a visible display.

To keep this routine for later reference, put an apostrophe marker in Line 5. You will hold the routine harmless, but available.

Get in the habit of using the *REM* marker to hide or uncover program lines and routines. You will get lots of mileage out of this handy tool when you are experimenting or creating your own original work.

This *PRINT@* Text Screen can be accessed using *POKEs*. The memory locations of the Text graphics page begin at 1024. This memory location is equivalent to *PRINT@ 0*. The memory locations continue just as the *PRINT@* location and ends as memory location 1535, which is in the lower right-hand corner. It can also be called with *PRINT@ 511*.

Note that *PRINT@ 511-0* and memory location 1535-1024 both equal 511. Allow 1 for the location you are subtracting and you get 512, the total number of all possible locations.

Each one of these text screen locations may be accessed by means of *POKEx,y*, where 'x' is a specific location from 1024 to 1535 and 'y' is a value from 0 to 255.

So, what is *POKE* anyway? It is a statement that allows CoCo to place into a designated location whatever text screen character you desire. It has other uses not within the scope of this article. Press BREAK and add:

```
20 POKE 1066, 255 RUN.
```

This placed an orange block directly underneath the *PRINT@ 10*, black block.

PEEK allows you to look at a specified memory location to see what information, if any, resides there.

Press BREAK, *PRINT PEEK(129)*, and ENTER. This memory location is checked on I/O Error message when *CLOADing* a program from cassette. A zero means that memory is no good and if a one is returned, it signifies that the tape is no good. Try this:

```
PRINT PEEK(1066) ENTER.
```

The value of 96 is returned. This 96 represents 'blank' (empty). The reason for this is that we are not in the program, having broken out and location 1066 reverts to its original state, 'blank'.

The observant newcomer will notice that *CHR$(96)* is a reversed '@'. Verify this by unmasking Line 5. (Remove the apostrophe.) Mask Line 200 with '. Then add:

```
201 FOR X=96 TO 96 RUN.
```

This is a lazy person's way to substitute a single value in a *FOR TO* statement. If you used 201 X=96 you would still get the correct answer, but you'd also get an NF Error in 250. If this was an integral part of a real program, it would bomb out unless Line 250 was deleted.

This 'one value' hint is valuable when you may be experimenting with different values. OK! Press BREAK, mask lines 5 and 201 and unmask Line 200.

A disturbing fact remains. *CHR$(96)* and the 96 that was revealed by *PEEKing* at memory location 1066 are different. There are some differences between the ASCII characters using *CHR$* and the characters that CoCo recognizes from 0 to 255.

To compare the *POKEd* characters with the *CHR$* characters, change Line 200 and add Line 211:

```
200 FOR X=0 TO 127
211 POKE1269,X RUN
```

Let's make it neater. Press BREAK and change lines 210 and 211:

```
210 PRINT@234, CHR$(X)
211 PRINT@238, X
```

The graphics blocks from 128 to 255 are the same. If you want to check this out change Line 200 to include whatever values you care to compare.

Remember, the character displayed at the left, if any, is the ASCII code, and the character on the right is what CoCo will read for the same value when it is *POKEd* into a memory location.

You are urged to make a reference table of the two sets of characters, side by side, insofar as they differ.

Now press BREAK, and mask Line 5 again.

To demonstrate that one set can be substituted over the other, Line 23 will *POKE* an orange box over the black box at *PRINT@ 10* and Line 24 will superimpose a black box over the *POKEd* orange box, using *PRINT@*. Add and *RUN*.

```
23 POKE 1034, 255
24 PRINT@42, CHR$(128)
```

POKEing graphics characters is one quick way to cover large areas. Press BREAK and add:

```
6 GOTO 300
300 FOR L=1024 TO 1055
310 POKE L,255
320 NEXT L
500 GOTO 500
```

This creates an orange line that covers all the text screen locations on the top row. Add:

```
330 FOR M=32 to 63
340 PRINTM, CHR$(175)
350 NEXT M
```

Using blue, *CHR$(175)*, we can use *PRINT@ M*, all locations in the second row to fill them in. *RUN* BREAK and to make a left border add:

```
360 FOR L=1024 to 1504 STEP 32
370 POKEL,255
380 NEXT L
```

Since we want only one vertical column, in Line 360, we start at 1024 and skip 31 columns to put a dab of color in each 32nd, or left-hand, row. Purists will note that we should begin with location 1056, but it is easier to go over the corner block in the top row.

Using *PRINT@*, we will create an orange border on the right-hand side. Press BREAK and add:

```
385 FOR M=479 TO 31 STEP-32
390 PRINT@M, CHR$(255);
395 NEXT M
```

We went from bottom to top for a change of pace. Note that we were unable to use *FOR M=511* etc. because filling in this corner box would cause the screen to scroll up one row. Omit the semicolon at the end of Line 390 and watch a disaster area. We could fill that corner location safely with a *POKE* to avoid that pesky scroll. We do so when we create the bottom border. Press BREAK, add and *RUN*:

```
400 FOR L=1505 TO 1535
410 POKEL, 255
420 NEXT L
```

We can *PEEK(x)* a value while we are in the program. We will ask CoCo to check if memory location 1503 is orange, (255); *PRINT@ 237, "ORANGE"* and go ahead and create the bottom border. If 1503 is not orange, forget about the bottom border and skip to the end of the program. Press BREAK, add and *RUN*:

```
399 IF PEEK(1503)=255 THEN
PRINT237,“ORANGE”; ELSE 500.
```

To verify that this works, substitute 255 in Line 399 with another value and try it. As an alternate, pick an arbitrary *POKE* location, from 1024 to 1535 to see if it is orange.

You can *POKE* characters, other than the graphics values but, except for an asterisk or plus sign, which create neat borders or accents, it is silly to create a border of reversed @. Listing 1 will show an example of *POKEing* alphabetic characters.

At this time your mind is racing ahead with projects to try out. Before you do, put in the three missing blue sides of the inner border.

And, let's have some fun! Create a half-screen full of reversed @. Adjust the *POKEd* locations so the display is centered horizontally on the screen with a green band on the top and bottom. Open a partial row in the middle of the screen, leaving one blank space at each end and *POKE* your first name into the cleared space. Create a pause so your name may be read and then blank out the name slot with some graphics block.

Doing this exercise will give you ideas to either modify and improve what you have created, or go off into a frenzy of creativity in another direction.

Listing 1 is an example of using all *POKEs* to create a demonstration program which is somewhat similar to the exercise above.

One advantage of using the graphics characters, 128-255, is that you get to use all the colors available on your palette. You need not be an artist to have fun creating whatever your mind's eye conceives. You may wind up with some pretty impressive concoctions.

Some notes on Listing 1. Line 140 puts the top row of graphics characters on the screen the hard way — one at a time with an appropriate pause. Compare Line 140 with lines 180-210, which create the bottom segment.

There is no *RETURN* after Line 310, a *GOSUB* routine. This was a boo-boo. Since a similar routine follows, this effectively makes the pause 230 instead of 200. Can you see why? No harm was done and I failed to notice it.

Line 160 has no *GOSUB* pause between the two *POKEs* because they go onto the display as one unit. Line 230, the left border has a small pause between units so it blends nicely with lines 250-280, which override the text. Line 100 does not have the 'short' pause. It seemed to look better to have 0! come on as a single unit. The 'long' pause is used only before and after HELLO!

Read the listing and figure out what each program line does. Except for the two pause routines at the end, it is a

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linear program and each routine follows exactly as it appears on the screen.

Hopefully, you will have some ideas to modify, expand or enhance this listing, so what are you waiting for?

Note Listing 2 should not be keyed in. Just compare it with Listing 1. It is the same as Listing 1 except it is tightened up using multiple program lines. Two changes, the missing *RETURN* was added to Line 310 and in Line 10, 20 was changed to 10 due to deletion of Line 20 from Listing 1 and subsequent UL Error message. Which listing would you rather key in?

Listing 1:

```
0 '<LISTING1>
10 CLS
20 C=RND(255)
30 IF C<144 THEN 20
40 GOSUB310
50 POKE 1260,96
60 POKE 1261,72:GOSUB320
70 POKE 1262,69:GOSUB320
80 POKE 1263,76:GOSUB320
90 POKE 1264,76:GOSUB320
100 POKE 1265,79
110 POKE1266,97
120 POKE1267,96
130 GOSUB310
140 POKE1226,C:GOSUB320:POKE1227
,C:GOSUB320:POKE1228,C:GOSUB320:
POKE1229,C:GOSUB320:POKE1230,C:G
OSUB320:POKE1231,C:GOSUB320:POKE
1232,C:GOSUB320:POKE1233,C:GOSUB
320:POKE1234,C:GOSUB320:POKE1235
,C:GOSUB320:POKE1236,C:GOSUB320:
POKE1237,C
150 GOSUB320
160 POKE 1268,C:POKE 1269,C
170 GOSUB320
180 FOR X=1301 TO 1290 STEP-1
190 POKEX,C
200 GOSUB320
210 NEXT X
220 GOSUB320
230 POKE 1258,C:GOSUB320:POKE125
9,C
240 GOSUB320
250 FOR X=1260 TO 1267
260 POKEX,C
270 GOSUB320
280 NEXTX
290 GOSUB320
300 GOTO 10
310 FOR Z=1 TO 200:NEXT
320 FOR Z=1TO 30:NEXT
330 RETURN
```

Listing 2:

```
0 '<LISTING2>
10 CLS:C=RND(255):IFC<144 THEN 1
0:GOSUB310
50 POKE 1260,96:POKE1261,72:GOSU
B320:POKE1262,69:GOSUB320:POKE12
63,76:GOSUB320:POKE1264,76:GOSUB
320:POKE1265,79:POKE1266,97:POKE
1267,96:GOSUB310
140 POKE1226,C:GOSUB320:POKE1227
,C:GOSUB320:POKE1228,C:GOSUB320:
POKE1229,C:GOSUB320:POKE1230,C:G
OSUB320:POKE1231,C:GOSUB320:POKE
1232,C:GOSUB320:POKE1233,C:GOSUB
320:POKE1234,C:GOSUB320:POKE1235
,C:GOSUB320:POKE1236,C:GOSUB320:
POKE1237,C:GOSUB320
160 POKE 1268,C:POKE 1269,C:GOSU
B320
180 FOR X=1301 TO 1290 STEP-1:PO
KEX,C:GOSUB320:NEXT:GOSUB320
230 POKE 1258,C:GOSUB320:POKE125
9,C:GOSUB320
250 FOR X=1260 TO 1267:POKEX,C:G
OSUB320:NEXT:GOSUB320:GOTO10
310 FOR Z=1 TO 200:NEXT:RETURN
320 FOR Z=1TO 30:NEXT:RETURN
```

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32K DISK

Block Out Those Troublesome Granules With DISKTEST.UTL

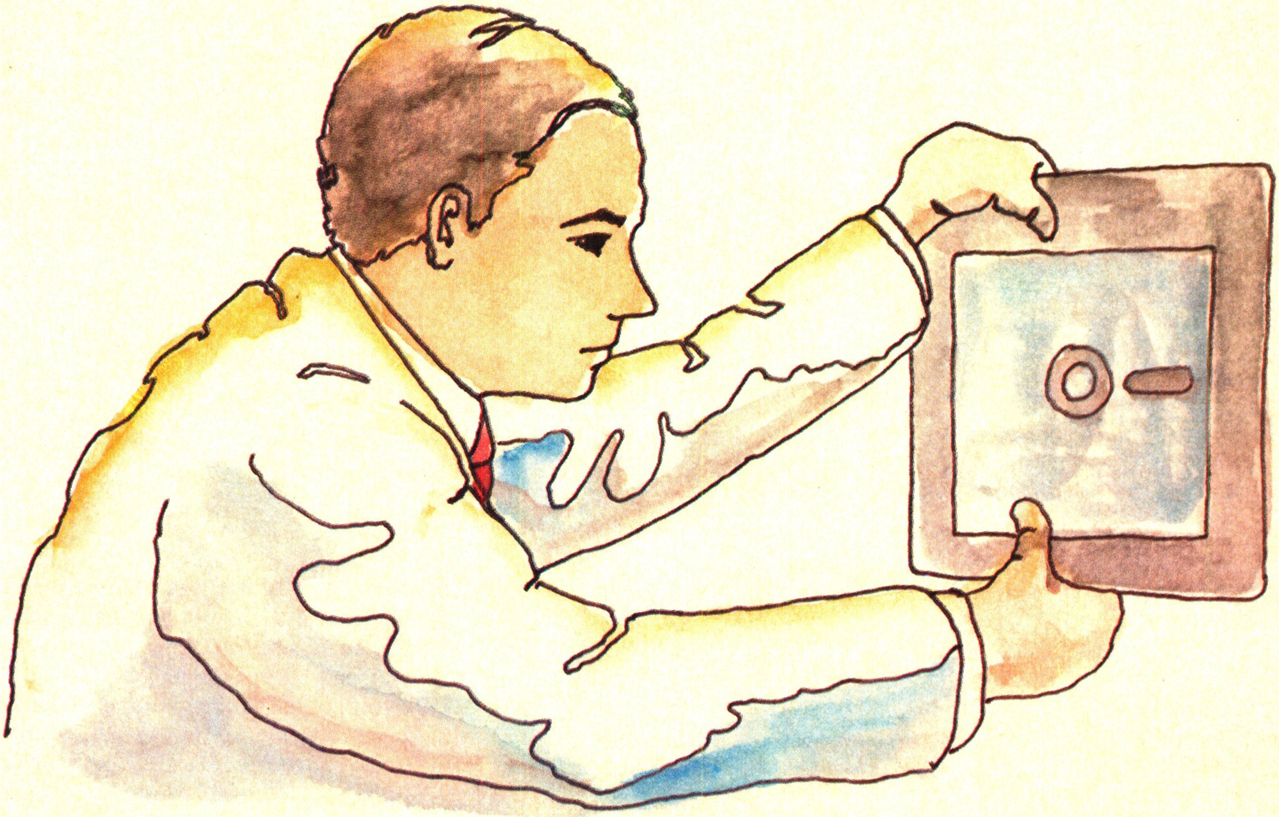
By Charles C. Zimmer

Did you ever pay the price of a good game program to buy a box of diskettes and carefully ration them out, only to find six months later one has a bad spot on it? You know if you take it back after six months you are going to get some raised eyebrows for claiming it had a bad spot on it when it was new. Or do you have some that have been used a lot on certain files to the point of producing errors, but the rest of the disk is practically new? You don't want to throw it away, but there's not a positive way to be sure you can avoid those bad spots.

(Chuck Zimmer is employed by Honeywell Information Systems, Inc. in Billerica, Mass. For the past 15 years he has worked in engineering, procurement and planning of all types of disk storage products.)

DISKTEST.UTL can help you overcome these problems and feel better about those good disks you have. The program gives your disks a thorough test by writing and reading all tracks with a variety of data patterns to check for errors. The test is contrived to produce the worst-case situations for data patterns and head positioning sequences so that it is not only a test of the diskette media, but is also a good test of the positioning accuracy of the drive.

If bad granules are found, the program writes a file on the disk called "DEFLOG.###" (### is the diskette



number) and all of the granules that contained an error are assigned to this file. This way they cannot be assigned to any of your files and therefore, are out of your way.

If you have a printer you are also given a one-line report of the test results. Your printout sheet can be reinserted in your printer so you can maintain a continuous diary of the test history of your disk library. This can help you in the future if it is necessary to reinitialize a disk. If you do not have a printer, you are given the chance to write down the list of bad granules for future use.

Some Notes Of Caution

1) The program does a complete overwrite of the disk, including the directory track, so be sure you no longer need or have otherwise backed up all the files on the disk.

2) If you elect to use disks with errors "flagged-out" (meaning bad spots have been "marked" and made unavailable), please remember that the Radio Shack Disk Operating System command *BACKUP* will be aborted if a read error is encountered. This means you will need to back up individual files by loading them into the computer and saving them to another disk. You cannot count on being able to back up the entire disk at once with the *BACKUP* command. (See "Compatibility Note" for a way to overcome this limitation.)

How You Use Diskettes

Each individual needs to make his own decision about using disks with errors; this can be influenced by your overall procedures for handling files. In my case, I have a printer which produces the ultimate backup, but I also use cassettes for important files and do double program saves on my disks, plus periodical transferring of files to other disks.

I use flagged disks for program development where there is a lot of traffic, which tends to wear out the remaining good places. When a program is finished and put in service, it is transferred to a good working disk for regular use. If you have other utilities for recovering from disk crashes, this can make you even more comfortable about using flagged disks.

The balance of this article is written assuming you plan to save and use flagged disks so all of the procedures are discussed. If you choose to discard disks with errors, the program is somewhat simpler to run and you will be notified of all you need to know.

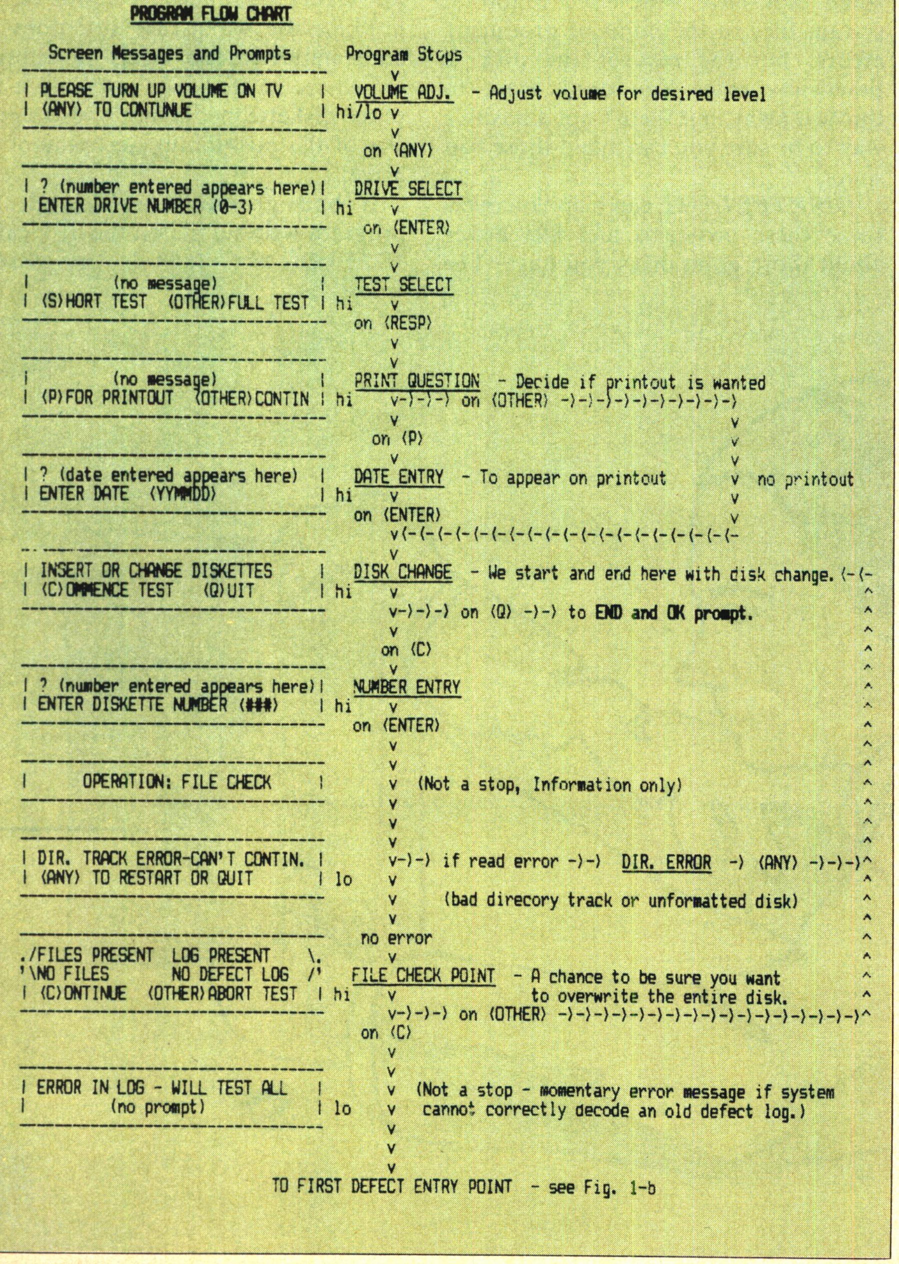
How The Program Runs

The program is self-prompting, and as it runs a series of messages will appear on Line 15, with prompts on Line 16 for the required responses. These appear whenever the program stops to accept an input from you.

An operating flow chart is shown in figures 1-a and 1-b. On the left are the messages and prompts which appear during the program. The information on the right side of the figures provides more explanation, and shows the program flow from stop to stop. The hi/lo legend beside the screen information tells which audio signal is given at the various stops. A high signal is to notify you that a normal stop has been reached. The low signal indicates an error condition. The program contains checks on inputs, so out-of-range inputs will not interrupt the program at critical places. Please note the disks must have been previously initialized with a *DSKINI* command.

The program begins by asking you to adjust the volume on the TV. Then you are asked to enter the drive number for the test, and to select between a short and a full test. If you want a printout of the results, you are next given the chance to input the day's date (six digit string). Printout or none, you then reach the main starting and stopping point called the DISK CHANGE point in Figure 1-a. Here, you insert the disk to be tested and when the test is completed, you will return to this point. You may then remove the disk and

Figure 1-a



```
                 PROGRAM FLOW CHART

      Screen Messages and Prompts        Program Stops
   ------------------------------------        v
   | PLEASE TURN UP VOLUME ON TV     |    VOLUME ADJ.   - Adjust volume for desired level
   | <ANY> TO CONTUNUE               | hi/lo v
   ------------------------------------        v
                                          on <ANY>
   ------------------------------------        v
   | ? (number entered appears here) |    DRIVE SELECT
   | ENTER DRIVE NUMBER (0-3)        | hi      v
   ------------------------------------    on <ENTER>
                                               v
   ------------------------------------        v
   |          (no message)           |    TEST SELECT
   | <S>HORT TEST  <OTHER>FULL TEST  | hi      v
   ------------------------------------   on <RESP>
                                               v
   ------------------------------------        v
   |          (no message)           |    PRINT QUESTION  - Decide if printout is wanted
   | <P>FOR PRINTOUT  <OTHER>CONTIN  | hi      v->->-> on <OTHER> ->->->->->->->->->
   ------------------------------------        v                                      v
                                            on <P>                                    v
   ------------------------------------        v                                      v
   | ? (date entered appears here)   |    DATE ENTRY  - To appear on printout         v  no printout
   | ENTER DATE  <YYMMDD>            | hi      v                                      v
   ------------------------------------   on <ENTER>                                  v
                                               v<-<-<-<-<-<-<-<-<-<-<-<-<-<-<-<-<-<-
   ------------------------------------        v
   | INSERT OR CHANGE DISKETTES      |    DISK CHANGE  - We start and end here with disk change. <-<-
   | <C>OMMENCE TEST   <Q>UIT        | hi      v                                                  ^
   ------------------------------------        v->->-> on <Q> ->-> to END and OK prompt.          ^
                                               v                                                  ^
                                             on <C>                                               ^
   ------------------------------------        v                                                  ^
   | ? (number entered appears here) |    NUMBER ENTRY                                            ^
   | ENTER DISKETTE NUMBER (###)     | hi      v                                                  ^
   ------------------------------------   on <ENTER>                                              ^
                                               v                                                  ^
   ------------------------------------        v                                                  ^
   |       OPERATION: FILE CHECK     |         v  (Not a stop, Information only)                  ^
   ------------------------------------        v                                                  ^
                                               v                                                  ^
   ------------------------------------        v                                                  ^
   | DIR. TRACK ERROR-CAN'T CONTIN.  |         v->-> if read error ->->  DIR. ERROR  -> <ANY> ->->->^
   | <ANY> TO RESTART OR QUIT        | lo      v                                                  ^
   ------------------------------------        v     (bad direcory track or unformatted disk)     ^
                                               v                                                  ^
   ------------------------------------     no error                                              ^
   ./FILES PRESENT  LOG PRESENT      \.        v                                                  ^
   '\NO FILES       NO DEFECT LOG    /'   FILE CHECK POINT  - A chance to be sure you want        ^
   | <C>ONTINUE  <OTHER>ABORT TEST   | hi      v                   to overwrite the entire disk.  ^
   ------------------------------------        v->->-> on <OTHER> ->->->->->->->->->->->->->->->->->^
                                            on <C>
                                               v
   ------------------------------------        v
   | ERROR IN LOG - WILL TEST ALL    |         v  (Not a stop - momentary error message if system
   |          (no prompt)            | lo      v   cannot correctly decode an old defect log.)
   ------------------------------------        v
                                               v
                                               v
                       TO FIRST DEFECT ENTRY POINT  - see Fig. 1-b
```

insert the next for another test (repeating the test sequence) or quit, in which case the program ends in an orderly manner. When you continue from this point, the program makes a stop for you to enter the number of the diskette (up to 999).

After this, the program checks to see if files exist on the disk and also if there is a defect log file from a previous test. You are told of these findings at a stop called the FILE CHECK POINT. If you had previously tested the disk and it had defective granules, the program recovers this information by reading the old log and saving the numbers of the bad granules previously found. During the test sequence, the program will not take the time to retest the old bad granules because we want to be conservative and not think something that was once bad has become good again.

Perhaps the most important feature of the FILE CHECK POINT is when the program stops. The upper half of the screen is showing you the first sector of the directory entries (Sector 3 on track 17), and you will see your filenames to help you recognize that you have loaded a disk containing files; they will be completely overwritten if you proceed with the test. If you made a mistake, this is the time to abort the test (the prompt tells you how).

If everything is OK you press 'C' to continue. I have used 'C' where possible as the go-ahead response. This makes it easier to work your way through the prompts.

You then come to the FIRST DEFECT ENTRY POINT shown at the top of Figure 1-b. Here you are shown a defective granule map. You can manually enter defective granule numbers that you want to avoid and they will be incorporated in the defect log. Time will not be spent testing them. You will enter the granules from an old printout or manual log if the disk has been so totally crashed that the old log can't be read, or if you have used a bulk eraser on the disk. Upon continuing from this point the actual testing finally begins.

During the test sequence the upper half on the screen is the actual disk I/O buffer, so you see the graphics representation of the patterns being written to and read from the disk. The lower half of the screen contains a table giving the progress of the test, and the area of the disk being tested at the moment.

You should know two things about the test cycle. First, the program uses the Radio Shack *DSKCON* ROM routine to actually perform the test. This is a powerful routine which not only performs seeks and reads or writes, but also performs retries in the event of an error. Many times you can tell when a read error occurs because the drive "recalibrates" (positions to track 0 and then back to the commanded track) four times in an attempt to perform the operation successfully. If after four attempts it is unsuccessful, an error code is created indicating the granule is bad. "Transient" errors, where the operation is succussfully performed within the four tries, are not counted as "hard errors" and therefore are not logged.

If you notice the granule number during transient errors, you may wish to manually flag this granule bad at a later point in the program.

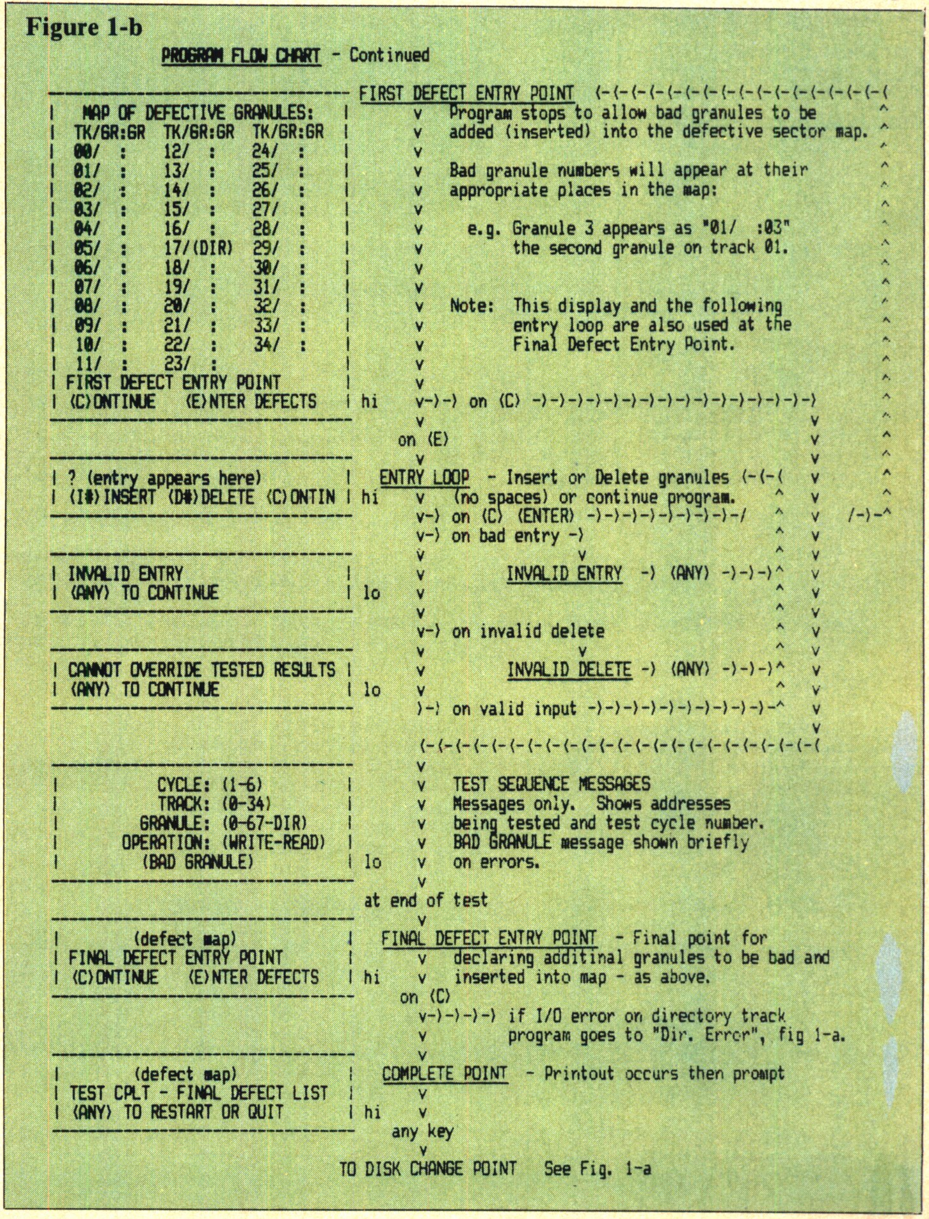
The second thing about the test cycles is that watching the screen and listening to the rhythmic operation of the drive can be hypnotic, so if you fall asleep please don't send me a bill for lost computer time.

The testing takes from four to 10 minutes, depending upon an option discussed later.

After the test is finished, you come to the FINAL DEFECT ENTRY point and are shown the defective granule map again (new bad granules are in reverse video). You may then manually flag additional granules as bad. This is another important step in the program for the following reason: if there is a bad spot on the surface of the disk, how do you know how big it is and how do you know that it lies only in the center of the track where the error occurred? The answer is you don't know how big it is, nor do you know that the edge of it doesn't extend a little over onto a neighboring track. The adjoining track works at this time, but may cause an error later.

To handle this little trauma and get

Figure 1-b



```
              PROGRAM FLOW CHART - Continued

------------------------------ FIRST DEFECT ENTRY POINT  <-<-<-<-<-<-<-<-<-<-<-<-<-<-<-<-<
|  MAP OF DEFECTIVE GRANULES: |         v  Program stops to allow bad granules to be     ^
| TK/GR:GR  TK/GR:GR  TK/GR:GR |        v  added (inserted) into the defective sector map. ^
| 00/  :    12/  :    24/  :  |         v                                                 ^
| 01/  :    13/  :    25/  :  |         v  Bad granule numbers will appear at their        ^
| 02/  :    14/  :    26/  :  |         v  appropriate places in the map:                  ^
| 03/  :    15/  :    27/  :  |         v                                                 ^
| 04/  :    16/  :    28/  :  |         v    e.g. Granule 3 appears as "01/  :03"         ^
| 05/  :    17/(DIR)  29/  :  |         v         the second granule on track 01.         ^
| 06/  :    18/  :    30/  :  |         v                                                 ^
| 07/  :    19/  :    31/  :  |         v                                                 ^
| 08/  :    20/  :    32/  :  |         v  Note:  This display and the following         ^
| 09/  :    21/  :    33/  :  |         v         entry loop are also used at the        ^
| 10/  :    22/  :    34/  :  |         v         Final Defect Entry Point.              ^
| 11/  :    23/  :            |         v                                                 ^
| FIRST DEFECT ENTRY POINT    |         v                                                 ^
| <C>ONTINUE   <E>NTER DEFECTS | hi     v->-> on <C> ->->->->->->->->->->->->->->->      ^
------------------------------          v                                        v       ^
                                     on <E>                                      v       ^
------------------------------          v                                        v       ^
| ? (entry appears here)      |   ENTRY LOOP  - Insert or Delete granules <-<-<  v       ^
| <I#>INSERT <D#>DELETE <C>ONTIN | hi   v   (no spaces) or continue program.  ^  v       ^
------------------------------          v-> on <C> <ENTER> ->->->->->->->->-/  ^  v   /->-^
                                        v-> on bad entry ->                  ^  v
------------------------------          v                 v                  ^  v
| INVALID ENTRY               |         v          INVALID ENTRY  -> <ANY> ->->->^  v
| <ANY> TO CONTINUE           | lo      v                                    ^  v
------------------------------          v                                    ^  v
                                        v-> on invalid delete                ^  v
------------------------------          v                 v                  ^  v
| CANNOT OVERRIDE TESTED RESULTS |      v          INVALID DELETE -> <ANY> ->->->^  v
| <ANY> TO CONTINUE           | lo      v                                    ^  v
------------------------------          >-> on valid input ->->->->->->->->->-^  v
                                                                                v
                                        <-<-<-<-<-<-<-<-<-<-<-<-<-<-<-<-<-<-<-<-<-<
------------------------------          v
|          CYCLE: (1-6)       |         v   TEST SEQUENCE MESSAGES
|          TRACK: (0-34)      |         v   Messages only.  Shows addresses
|        GRANULE: (0-67-DIR)  |         v   being tested and test cycle number.
|      OPERATION: (WRITE-READ) |        v   BAD GRANULE message shown briefly
|        (BAD GRANULE)        | lo      v   on errors.
------------------------------          v
                                at end of test
------------------------------          v
|         (defect map)        |   FINAL DEFECT ENTRY POINT  - Final point for
| FINAL DEFECT ENTRY POINT    |         v   declaring additinal granules to be bad and
| <C>ONTINUE   <E>NTER DEFECTS | hi     v   inserted into map - as above.
------------------------------      on <C>
                                        v->->->-> if I/O error on directory track
                                        v          program goes to "Dir. Error", fig 1-a.
------------------------------          v
|         (defect map)        |   COMPLETE POINT  - Printout occurs then prompt
| TEST CPLT - FINAL DEFECT LIST |       v
| <ANY> TO RESTART OR QUIT    | hi      v
------------------------------      any key
                                        v
                         TO DISK CHANGE POINT   See Fig. 1-a
```

some sleep at night, I arbitrarily decide the two granules physically adjacent to the one having the error are also bad, and I manually flag them as such at this point. The granules you will flag are numerically two granules above and below the bad one so that, for example, if granule 50 is bad you will enter I48RETURN and I52RETURN when in the ENTRY LOOP of Figure 1-b. If you are not having a printout, this is the time to manually write down the defective granule numbers in a media log of some sort.

Upon continuing from the final defect entry point, you will see the file allocation table being created (if there are bad granules). You will then see a directory entry created for the DEFLOG.###" file; it will be "killed" (first character set to zero) if there are no bad granules. There will be a pause and printout (if this is elected), and the program returns to the DISK CHANGE POINT from where you end or begin another test.

Initialization Notes

Page 58 of the Radio Shack disk manual describes bytes 0-55 of the sector as "system controls" information. Technically, this is a "header" field which is written only when the disk is initialized, and it identifies the upcoming sector number to the controller. The controller always reads this header before reading or updating the data field. In running *DISKTEST.UTL*, you may detect errors not caused by defects in the media, but because a system glitch

Figure 2

```
              DEFECT LOG PRINTOUT SUBROUTINES (OKIDATA 92 Codes)

line 225 --------------- PRINT ID SUBROUTINE  - BEGINS WITH A PRINTING DRIVER

                            Set computer baud to 2400 baud or for these rates: 300  600 1200
POKE 149,0:                 Set MSB of baud rate in computer |POKE 149,)         1    0    0
POKE 150,18:                Set LSB of baud rate in computer |POKE 150,)       202  180   87
POKE 155,96:                Sets line width = 96 in CoCo     |POKE 155,80 for 80 col-only
PRINT#-2,CHR$(28);          Sets printer for 12 cpi          |Delete for 80 col-only
      CHR$(27);CHR$(48);    Code to set draft printing mode  |Delete for single mode printers

line 230 --------------- PRINT IDENTIFICATION INFORMATION

PRINT#-2,USING"% %d#%% %     % ";RIGHT$(LN$,3),D1,T$,D$;:
               | |||||||     |^--Print space for legibility
               | ||||||^^^^^^---Print date (6 digits)
               | |||||^---------Print space for legibility
               | |||^^----------Print Sh or Lg for test type
               | |^^------------Print d followed by drive #
               ^^^--------------Print diskette number

               Note:  If 80 col-only there will not be enough room on the line for all of
                      these items.  Substitute PRINT#-2,USING"% % %    % ";RIGHT$(LN$,3),D$;:

RETURN                      Return from PRINT ID subroutine

line 235 --------------- PRINT LOG SUBROUTINE  - BEGINS BY
                         PRINTING A CHARACTER INDICATING THE CONDITION OF THE GRANULE

X2=0:                       Clear gran counter to zero
FOR X=0 TO 67:              Start of loop to scan granule array

    IF G(X)=&HB9 THEN PRINT#-2,"-";        (-) for a granule found bad in a previous test
ELSE IF G(X)=&H99 THEN PRINT#-2,CH$(34);   (") for grans you declare bad in in this test
ELSE IF G(X)=&HE9 THEN PRINT#-2,".";       (.) where an error occurred in this test
ELSE PRINT#-2,USING"#";X2;                 (least sig. digit of gran #) for good granules

line 240 --------------- PRINT MOST SIGNIFICANT DIGIT OF GRANULE # After each 10 granules

               Note:  If 80 col-only there is not enough room on the line for these extra
                      tens digits.  Delete all PRINT#-2 statements this line.

X2=X2+1: IF X2=10 THEN X2=0:  Increment gran counter. If 10 done reset the counter and
                              print a superscripted, bold, double width "Tens" digit.

PRINT#-2,
   CHR$(27);CHR$(74);       Set superscript printing
   CHR$(28);CHR$(31);       Set double width print mode
   CHR$(27):CHR$(84);       Set emphasized (bold) print
PRINT#-2,USING"#";X/10;     Print the "Tens" digit for the next ten granule numbers
PRINT#-2,                   Start of control codes to restore normal printing
   CHR$(27);CHR$(73);       Stop emphasized printing
   CHR$(28);                Set 12 cpi printing again
   CHR$(27);CHR$(75);:      Stop superscript printing
NEXT ELSE NEXT              Go to next granule in FOR loop

line 245 --------------- COMPLETE PRINTING OF DEFECT LOG

PRINT#-2,"": RETURN         Since all print commands used (;) for no carriage return &
                            line feed you provide a CR/LF here, then end subroutine
-----------------------------------------------------------------------------------------
Sample of log printout with 12 cpi matrix printer:

101d0Lg 831124 01234567891 0123-5678920123"5.7"93012345678940123456789501234567896012345667
-----------------------------------------------------------------------------------------
Sample of log printout with 10 cpi 80 col-only printer:

101 831124 01234567890123-567890123"5.7"901234567890123456789012345678901234567
-----------------------------------------------------------------------------------------
```

— or yes, operator error — causes header areas to be garbled (written over). If you suspect this may have happened, you can reinitialize the disk *(DSKINI)* to rewrite these areas anew. This is one case where you may find that disks once bad do become good again. Bulk erasing before *DSKINI* will really give a clean start.

Compatibility Note

DISKTEST.UTL is compatible with the *Disk Backup Utility* by Roger Schrag in the December 1983 RAINBOW, in that his program will back up disks which have been tested with *DISKTEST.UTL*. The good sectors in the granules flagged by *DISKTEST.UTL* will be copied to the backup disk, and the sectors having errors will be bypassed by the backup program. After running the backup, you may want to *KILL* the DEFLOG.### file which was transferred to the backup disk and is irrelevent on the backup copy. As mentioned in the "Backup Utility" article, you cannot back up to a flawed disk, so you should use only disks found error-free by *DISKTEST.UTL*.

Program Preparation And Options

There are a few things to go over before you begin typing in the program (Listing 1). Some of the points are technical, relating to your system configuration, and some are "cosmetic" options allowing you to adapt the program to your preferences.

First the functional subjects:

Memory Requirements

If you have a 32K machine the complete program will fit easily, including comments so you can go on to the next point. If you have a 16K machine all of the functional program will fit, but it will be necessary to delete some non-essential information. You should delete all lines beginning with ' starting at Line 30, delete all but the program name in Line 10, and delete the *PRINT* statement in Line 320. There is another option for 16K users to gain additional memory, and that is to insert a *PCLEAR 1* statement at the end of Line 15. This will free up an additional 4608 bytes (three graphics pages), which is more than adequate for the complete program, including comments.

A *PCLEAR 1* can make it necessary to cycle the power switch off and on in older machines in order to regain all four graphics pages for running your next program. Do not clear all graphics pages because special machine language routines are stored in graphics Page 1.

Systems With No Printer

If you wish, you can enter all of the code, including the printer sections, in anticipation of the future addition of a printer. You can avoid unnecessary menu steps dealing with the non-existent printer by changing the end of Line 315 from . . . . *GOSUB265:GOSUB200:GOTO350* to the following: . . . . *GOSUB265:P=0:GOTO350*. Technically, all that is necessary is to delete the *GOSUB200* since all BASIC variables are initialized to zero at *RUN*, but this just seems a little more positive to me. If you do not wish to bother with the printer code at all, it may be omitted as follows:

Omit lines 195-205
Omit lines 220-245
Omit the GOSUB 200 in Line 315
Omit the IFP=1. . . .ELSE code in 330
Omit Line 620

Adapting To Your Printer

The program as listed contains printer driver codes and control sequences required by my printer, an Okidata Microline 92, and uses 12 cpi (96 column) printing. To assist you in adapting to other printers, Figure 2 gives a statement-by-statement description of the defect log printout subroutine. This explains what each step does so you can follow the same logical sequence using control codes for your printer, and come up with the same results. Special instructions are included to cover printers that are 80-column only. A sample of the output is shown at the bottom of the figure.

Creating Your Own Report

If you want to have an output that is less cryptic than my one-liner, you can write your own report subroutine to replace lines 225-245. Subroutine 225 is called at the end of the program in Line 620 and works with the following variables.

ARRAY G(69) in which the first 68 elements 0-67 contain one of four values representing the condition of the granules of the disk: Hex FF (OK), Hex B9 (bad from a previous test), Hex 99 (tested OK but declared bad by you in this test), and Hex E9 (bad due to an error detected during this test).

DN variable containing diskette number.

D$ string variable containing the date.

D1 contains the device number for the test.

T$ contains the test type, "Sh" or "Lg" for short or long test.

The RAINBOW

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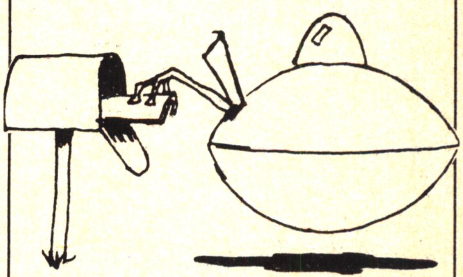

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Length And Comprehensiveness

The *DATA* statements in lines 460 and 465 control the data patterns and the sequence in which the tracks are tested. A longer test gives more confidence in the results than a short test, and the program provides you the option of making a choice between time and comprehensiveness. Line 460 does a rotating, worst-case pattern test (about six minutes), and Line 465 does a 1,0 test (about four minutes). Either alone is a complete test and both together are quite comprehensive. There is more information on these tests in the technical details section for those so inclined. If you think 10 minutes per diskette is a good investment, then both 460 and 465 should be used.

Drive Number

This provides for entering the number of the drive to be used for the test. If you have a single-drive system and wish to avoid this unnecessary menu step, you can delete the *GOSUB 255* in Line 315. You can also delete lines 250 and 255 entirely, but this is not necessary.

Now a couple of fun options:

Background Color

The screens are formatted with information fields blocked out in green according to the way CoCo prints to the screen. You can change the surrounding background to any of the eight-plus black colors by substituting your color code in the Line 20 statement BC=3. For a black background color, we need to fool CoCo and use a value for BC = 1/16. Color code 3 (blue) is in the program because it produces a nice gray-scale contrast on a black and white TV. Happy viewing.

Audible Signals

Two strings are played at appropriate times, E$ for error conditions and A$ for attention points (usually stops). These reside in Line 285 and sound like crickets. If you would prefer something different, please feel free to wax musical and redefine these strings to suit your tastes. Just keep in mind that we're close to the memory limit in 16K, and also that a long string may make it necessary to adjust the amount of string space *CLEARed* in 15.

Debug Aids

Here are some suggestions to help you debug the program.

Scratch Disks

The first and most important thing to remember is that after you have typed the program, save it to disk and then take the disk out and insert a scratch disk to use for debug. Do *not* make your test runs with the disk containing the program in the drive because the execution of the program overwrites the disk! Another reason to use a scratch disk for debug is that the program contains machine language routines which are poked into memory. Errors in the ML code, or errors in the poking code, can cause CoCo to crash. The voice of experience speaks.

Shortened Test

The second tip is to shorten the test cycle so you can get all of the menu and program control code working without long waits for the test process. Listing 1 contains a "commented" Line 475 which does a short read of tracks 0-3. This is only for use during debug, but will not hurt anything if executed during actual running of the program. Line 490 causes the program to skip over the test codes contained in Line 460, so for debug, Line 490 can be changed to make it skip even more codes. For a short debug run remove the ' in Line 475, change the *TO70* in Line 490 to *TO120*, and use the short test option. This should reduce the "test cycle" to less than 10 seconds. When finished debugging, don't forget to re-comment Line 475 (insert ' before *DATA)*, and change the Line 490 *TO* value back to 70.

Forced Conditions

There are a number of branches in the program that may never be used unless you encounter the right conditions. Many of these deal with error processing. You can force these branches by temporarily editing the program to insert the right conditions at the branch points. You should observe the rule to do only one at a time and be sure to delete the temporary code before going on to the next branch. Here are the places to modify:

Insert EC=1:	after GOSUB35:	in Line 365
Insert EC=1:	after GOSUB35:	in Line 390
Insert EC=1:	after EC=USR2(X3):	in Line 535
Insert EC=2:	after EC=USR2(X3):	in Line 535
Insert EC=1:	after NEXTX4:	in Line 590
Insert EC=1:	after NEXTX4:	in Line 605
Insert X2=100:	after G(X1)=&HB9:	in Line 430

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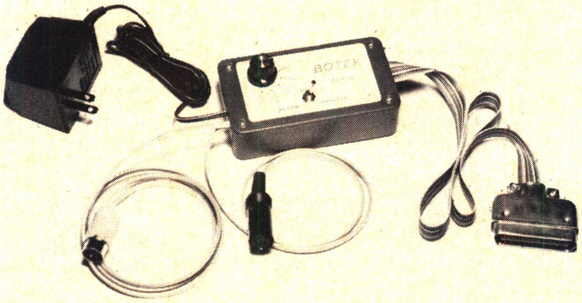

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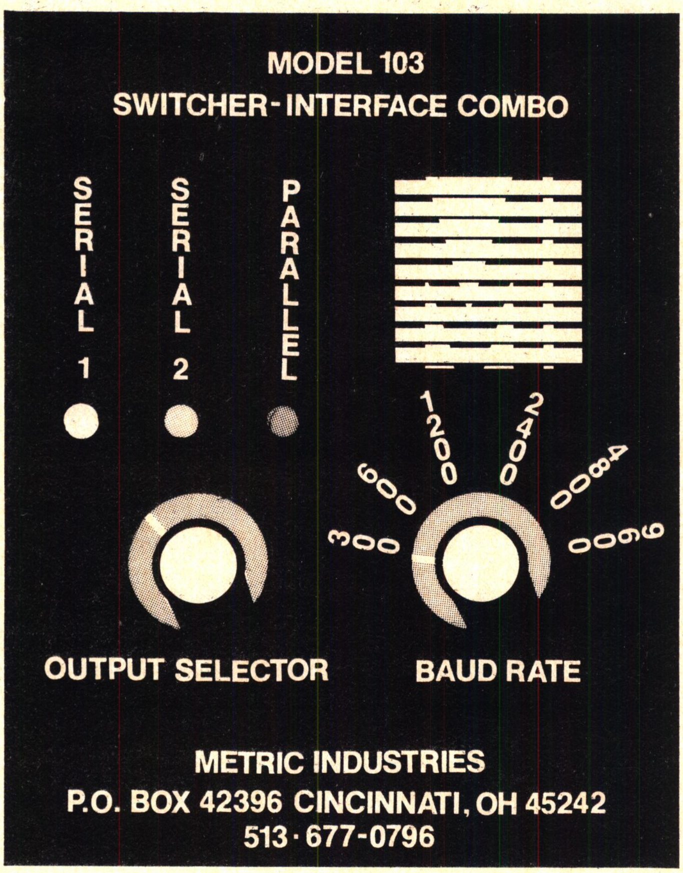
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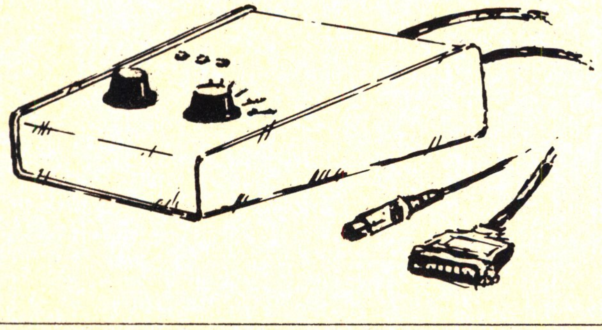

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Technical Information

The information that follows is provided for persons wanting to know more about the program and the testing of magnetic recording media. This information need not be read to enter and use the program.

Recording Codes

When the drive records data on the disk, what it does is magnetize the iron oxide material moving under the head in a direction along the track. As the stream of bits is fed to the drive, the direction of the magnetization is switched back and forth along the track according to an encoding algorithm. The effect is equivalent to producing a series of small bar magnets laid end to end along the track, except they vary in length and each successive one is turned around (of opposite magnetic polarity) with respect to its neighbors.

Later on, when reading the track, these small magnets are moved under the head and each time the junction between two adjoining magnets passes under the head the magnetic flux through the head reverses, causing a small voltage to be induced in the head. This signal is amplified and processed to become the data sent back to the computer. What is important is the time sequence of these "flux reversals," because this is what determines if they are translated into ones or zeros.

The point of this discussion is if we want to test the media, what we want to do is find data patterns that let us put flux reversals at all of the places they can be, and then read the disk to see if they are properly recorded. Some patterns of flux reversals are harder to recover than others, so our test can include data that will produce these worst-case patterns as well.

The main reason some patterns are hard to recover is because if the magnets are not all the same length, the short ones, being crowded and under more pressure, tend to get longer making their long neighbors shorter and shifting the point at which the flux reversal occurs. This produces what is called "peak shift" in the read signal which causes timing and data errors.

The standard data pattern used to create a worst-case peak shift is a repetitive Hex DB6. Since this is a 12-bit value it is sent to the drive in a 3-byte sequence, DB 6D B6, etc. Figure 3 shows five data patterns used in this test, the first of which is the DB6 pattern. For each pattern there is a line of asterisks representing where the flux reversals would occur along the track when the pattern is recorded. The symbols '(' and ')' show the direction of peak shift due to the magnetic crowding described above.

If you look over the set of patterns, you will see places where flux reversals can occur that DB6 does not test. It is for this reason that multiple patterns are used. Patterns 6DB and B6D together with DB6 produce what is known as a rotating worst-case pattern test, wherein all data 1 bits are subjected to peak shift in both directions.

In contrast, the Radio Shack disk initialization routine writes a repetitive FF pattern which tests all data 1 bit positions in one pass, but does not introduce peak shift. For a one-pass test this is a good choice, but more passes provide better comprehensiveness.

The 00 pattern also has uniform spacing (no peak shift), but you will notice that it is not in phase with the locations produced by an FF pattern. The 00 pattern essentially tests another whole set of flux reversal locations.

By using all five patterns, *DISKTEST .UTL* provides a quite comprehensive test of the media.

Other Causes of Errors

Data error problems can result from things other than imperfect media; here are a few other causes. The first is "adjacent track interference," meaning that the head is picking up some signal from the next track which is hindering its attempt to read the track it is on. This can be caused by wear, friction or looseness in the head positioning mechanism which prevents the head from stopping exactly in the center of the track.

An inadequate overwrite capability can also be a problem. When data is written, the head actually records the new data onto the track by forceably remagnetizing the oxide surface. If the write current is not correct, the head may not be strong enough to completely remagnetize the track, meaning that remnants of the old data could be

Figure 3

```
          TEST PATTERN CODING AND RECORDING

Pattern  0 is a repetitive Hex DB6 sent to disk as a repeating 3 byte sequence = DB 6D B6 etc.
Pattern  1  " "      "      "  6DB   "   "   "   " "     "     "   "      "    = 6D B6 DB etc.
Pattern  2  " "      "      "  B6D   "   "   "   " "     "     "   "      "    = B6 DB 6D etc.
Pattern  5  " "      "      "  00    "   "   "   " "     "     "   "      "    = 00 00 00 etc.
Pattern  8  " "      "      "  FF    "   "   "   " "     "     "   "      "    = FF FF FF etc.

(0) DB6 DATA TO DISK  |       D       |       B       |       6       |       D       | etc.
    Data Bit Sequence | 1   1   0   1 | 1   0   1   1 | 0   1   1   0 | 1   1   0   1 | 1
    Recorded Flux-Rev   *   *)     (*   *)     (*   *)     (*   *)     (*   *)     (*   *)

(1) 6DB DATA TO DISK  |       6       |       D       |       B       |       6       | etc.
    Data Bit Sequence | 0   1   1   0 | 1   1   0   1 | 1   0   1   1 | 0   1   1   0 | 1
    Recorded Flux-Rev      (*   *)     (*   *)     (*   *)     (*   *)     (*   *)     (*

(2) B6D DATA TO DISK  |       B       |       6       |       D       |       B       | etc.
    Data Bit Sequence | 1   0   1   1 | 0   1   1   0 | 1   1   0   1 | 1   0   1   1 | 0
    Recorded Flux-Rev   *      (*   *)     (*   *)     (*   *)     (*   *)     (*   *)

(5) 00  DATA TO DISK  |       0       |       0       |       0       |       0       | etc.
    Data Bit Sequence | 0   0   0   0 | 0   0   0   0 | 0   0   0   0 | 0   0   0   0 | 0
    Recorded Flux-Rev *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *

(8) FF  DATA TO DISK  |       F       |       F       |       F       |       F       | etc.
    Data Bit Sequence | 1   1   1   1 | 1   1   1   1 | 1   1   1   1 | 1   1   1   1 | 1
    Recorded Flux-Rev   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *   *

    The pattern number (#) is the argument sent to the "Pagefill" ML routine.
    * indicates flux reversal points where direction of magnetization changes.
```

interfering with the new data when you try to read it.

Believe it or not, you could have media which is "too hot" for your drive. Your drive may be able to write these diskettes but not fully overwrite them.

The purpose of this discussion is to show that to test the media (and drive), you need to give it a sequence of writes, reads and seeks that will attempt to induce errors from the causes mentioned above; your actual operating modes will respect no orderly sequence of reads and writes.

Test Sequences

Figure 4 shows the sequence of writes and reads used in *DISKTEST*. It shows that each write is done in two passes, first by writing even tracks (or odd) while stepping in one direction and then by writing the odd (or even) tracks while stepping in the opposite direction. This is done to induce problems that would result from positioning errors. Not only that, but the pattern being written on alternate tracks is different to induce problems from adjacent track interference.

Reads are also done in two passes following the odd/even scenario, except we always approach a track when reading from the opposite direction that we approached it when it was written. If this isn't fiendish enough, the rotating worst-case pattern test overwrites each track three times, each time with a different pattern and with the head approaching the track from the opposite direction than on the prior write.

If your drive and diskette media passes this test (and thankfully most do), then you have a high confidence that both are OK. If you run into problems which are widespread (occurring at many places on the disk), then it is more than likely that something is wrong with your drive or you have the wrong type of media for your drive. Media errors are random and generally not widespread.

Needless to say, the sources for errors mentioned above are beyond the ability of most of us to fix, so a visit to your local repair center is called for if you cannot isolate the problem to the media.

Figure 4

```
              READ, WRITE & POSITIONING SEQUENCES

                     PATTERN & SEEK DIRECTION
CYCLE#   OPERATION   EVEN TRACKS   ODD TRACKS
-----------------------------------------------
INTERLEAVED ROTATING WORST-CASE PATTERN TEST
-----------------------------------------------
  1 (*)    WRITE       DB6  IN
           WRITE                   6DB OUT
           Read track 0 only; to set up for next
           READ                       IN
           READ          OUT
-----------------------------------------------
  2 (*)    WRITE                   B6D  IN
           WRITE       6DB OUT
           READ           IN
           READ                     OUT
-----------------------------------------------
  3 (*)    WRITE       B6D  IN
           WRITE                   DB6 OUT
           Read track 0 only; to set up for next
           READ                       IN
           READ          OUT
-----------------------------------------------
INTERLEAVED 1,0 TEST
-----------------------------------------------
  4 (1)    WRITE        FF  IN
           WRITE                    00 OUT
           Read track 0 only; to set up for next
           READ                       IN
           READ          OUT
-----------------------------------------------
  5 (2)    WRITE                    FF  IN
           WRITE        00 OUT
           READ           IN
           READ                     OUT
-----------------------------------------------
  6 (3)    WRITE     Directory track only, FF
                  (a housekeeping cleanup pass)
-----------------------------------------------
 Patterns DB6, 6DB, B6D, FF & 00 are described
 in Figure 2.
 (#) are cycle numbers shown in the short test,
 steps (*) are not done in the short test.
```

Programming Techniques

Three machine language subroutines are used in the program to perform functions which were significant bottlenecks when implemented in BASIC. They are embedded in the BASIC program (lines 290, 295 and 300) in Hex program strings (P$). These contain the literal object code the assembler produced.

The string is defined and then a start address (X1) is sent to a subroutine (190) which pokes the string into memory. The same string name is reused on subsequent loads because this is done only once, and there is no reason to have a lot of string space tied up forever with these routines. At the end of the loads the program string is shortened by defining it to be of no length (""). Please check and recheck the entry of these strings.

The first routine (Line 290) is too short to list, it is simply JSR [$C000] (Call *DSKCON)*, followed by RTS. The second, *Pagefill* is described in Listing 2 and is in program Line 295. It puts the write patterns in the disk I/O buffer. The third is *Grantest* (Listing 3), which does an operation on all nine sectors of a granule and is in Line 300. These subroutines bring the run time down from over 30 minutes to a more reasonable level.

Editor's Note: *At the last minute, we discovered that the* Pagefill *and* Grantest *source code listings were inadvertently left out. They will appear in next month's* RAINBOW. *They* do not *affect running the main program.*

If you decide to study the program flow, here are a few tips. The array G(69) that stores the granule quality indicators does not always correlate with addressable logical granules. It does at the beginning, but before the test sequence the array is opened up in the middle to provide space for two pseuso-granules that the directory track occupies. At this point the array is considered to represent physical granules. Later, the array is closed up again (eliminating the directory granules), so the first 68 elements again correlate with the logical granules of the disk.

DISKTEST.UTL is offered for the personal use of readers of RAINBOW Magazine. I hope the program is useful and enhances your enjoyment of your CoCo system.

75	109
120	35
210	7
260	158
305	149
380	251
460	177
519	178
END	5

The listing:

```
10 'DISKTEST.UTL 1.1 (C) 1983 BY
CHARLES C. ZIMMER  101 AUSTIN RD
         SUDBURY, MA 01776
15 CLEAR90
20 BC=3:CLSBC
25 GOSUB180:GOTO 280
30 'i/o sub-------------------
35 POKEPP,O1:POKEPP+1,D1:POKEPP+
2,T1:POKEPP+3,S1:POKEPP+4,4:POKE
PP+5,0:X=USR0(0):EC=PEEK(PP+6):R
ETURN
40 'gran to disp sub-----------
45 IFX>33THENG=X+2ELSEG=X
50 IFG(X)=&HFF THENM$="  "ELSEM$
=RIGHT$(STR$(X),2)
55 PL=69+32*INT((G-24*INT(G/24))
/2)+10*INT(G/24)+(G-2*INT(G/2))*
3
60 IFG(X)<>&HE9 THENPRINT@PL,USI
NG"%%";M$;:RETURNELSEFORX2=0TO1:
POKE&H0400+PL+X2,ASC(MID$(M$,X2+
1,1)):NEXTX2:RETURN
65 'inkey sub------------------
70 K$=INKEY$:IFK$=""THEN70ELSERE
TURN
75 'pause sub------------------
80 PRINT@I1,M1$;:GOSUB70:GOSUB17
0:RETURN
85 'defect list form sub-------
90 CLSBC:PRINT@3,"MAP OF DEFECTI
VE GRANULES:";:X3=0:FORX1=34TO54
STEP10:PRINT@X1,"TK/GR:GR";:FORX
2=1TO12:PRINT@X1+32*X2,USING"##"
;X3;:PRINT"/  :  ";:X3=X3+1:NEXT
X2,X1:PRINT@438,STRING$(8,F$);:P
RINT@239,"(DIR)";:RETURN
95 'list defects sub-----------
100 GOSUB90:FORX=0TO67:IFG(X)=&H
B9 ORG(X)=&H99 ORG(X)=&HE9 THENG
OSUB45:NEXT:RETURNELSENEXT:RETUR
N
105 'declare defects sub--------
110 PRINT@I3,M3$;"DEFECT ENTRY P
OINT      ";:PRINT@I1,"<C>ONTINU
E   <E>NTER DEFECTS  ";:PLAYA$
115 GOSUB70:IFK$="C"THENRETURNEL
SEIFK$="E"THENGOSUB170:GOTO120EL
SEPLAYE$:GOTO115
120 PRINT@I3,STRING$(30,32);:PRI
NT@I1,"<I#>INSERT <D#>DELETE <C>
ONTIN";:PLAYA$:PRINT@I3,"";:INPU
T" ";I$:PRINT@I3+30,F$;:L$=LEFT$
(I$,1):IFL$="C"THEN110ELSEIFL$="
D"ORL$="I"THEN125ELSEGOSUB155:GO
TO120
125 X1=LEN(I$)-1:FORX2=1TOX1:IFM
ID$(I$,X2+1,1)<"0"ORMID$(I$,X2+1
,1)>"9"THENX2=X1:GOSUB155:NEXT:G
OTO120ELSENEXT:I=VAL(RIGHT$(I$,X
1)):IFI<0ORI>67THENGOSUB155:GOTO
120
130 IFG(I)=&HB9 ORG(I)=&HE9 THEN
PRINT@I3,"CANNOT OVERRIDE TESTED
 RESULTS";:PRINT@I1,M1$;:PLAYE$E
LSE140
135 GOSUB70:GOTO120
140 IFL$="I"THENG(I)=&H99 ELSEG(
I)=&HFF
145 X=I:GOSUB45:GOTO120
150 'invalid resp sub----------
155 PRINT@I3,"INVALID ENTRY
```

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```
                ";:PRINT@I1,M1$;:PLA
YE$
160 GOSUB70:RETURN
165 'msg clear sub-------------
170 PRINT@I3,C$;F$;F$;C$;:RETURN
175 'logo sub------------------
180 PRINT@134,"* D I S K  T E S
T *";:PRINT@224,"COPYRIGHT (C) 1
983 BY C C ZIMMER";:RETURN
185 'ml load sub---------------
190 FORX=0TOLEN(P$)/2-1:POKEX1+X
,VAL("&H"+MID$(P$,1+2*X,2)):NEXT
X:RETURN
195 'print question sub--------
200 PRINT@I1,"<P>FOR PRINTOUT  <
OTHER>CONTIN";:PLAYA$
205 GOSUB70:IFK$<>"P"THENP=0:RET
URNELSEP=1:PRINT@I1,"ENTER DATE
 <YYMMDD>                ";:PRINT@I3,S
TRING$(30,32);:PRINT@I3,"";:PLAY
A$:INPUTD$:PRINT@I3+30,F$;:RETUR
N
210 'diskette # sub------------
215 PRINT@I1,"ENTER DISKETTE NUM
BER <###>    ";:PRINT@I3,STRING$(
30,32);:PRINT@I3,"";:PLAYA$:INPU
TDN:LN$=LEFT$(LN$,8)+RIGHT$("000
"+RIGHT$(STR$(DN),LEN(STR$(DN))-
1),3):GOSUB170:RETURN
220 'print id sub--------------
225 POKE149,0:POKE150,18:POKE155
,96:PRINT#-2,CHR$(28);CHR$(27);C
HR$(48);
230 PRINT#-2,USING"% %d#%% %
% ";RIGHT$(LN$,3),D1,T$,D$;:RETU
RN
234 'print log sub-------------
235 X2=0:FORX=0TO67:IFG(X)=&HB9
THENPRINT#-2,"-";ELSEIFG(X)=&H99
 THENPRINT#-2,CHR$(34);ELSEIFG(X
)=&HE9 THENPRINT#-2,".";ELSEPRIN
T#-2,USING"#";X2;
240 X2=X2+1:IFX2=10THENX2=0:PRIN
T#-2,CHR$(27);CHR$(74);CHR$(28);
CHR$(31);CHR$(27);"T";:PRINT#-2,
USING"#";X/10;:PRINT#-2,CHR$(27)
;"I";CHR$(28);CHR$(27);CHR$(75);
:NEXTELSENEXT
245 PRINT#-2,"":RETURN
250 'drive # sub---------------
255 PRINT@I1,"ENTER DRIVE NUMBER
 (0-3)       ";:PRINT@I3,STRING$(
30,32);:PRINT@I3,"";:PLAYA$:INPU
TD1:GOSUB170:RETURN
260 'test type sub-------------
265 PRINT@I1,"<S>HORT TEST  <OTH
ER>FULL TEST";:PLAYA$
270 GOSUB70:IFK$="S"THENT$="Sh":
RETURNELSET$="Lg":RETURN
275 'initialization............
...
280 I1=481:I3=449:FC=127+16*BC:B
$=CHR$(128):C$=STRING$(30,FC):F$
=CHR$(FC):PP=256*PEEK(&HC006)+PE
EK(&HC007):DIMG(69):DEFUSR0=&H0E
00:DEFUSR1=&H0E0A:DEFUSR2=&H0E86
:B=&H0400
285 LN$="DEFLOG  ":A$="V31;O5;L3
5;T50;EP3EP3E":E$="V31;O3;L35;T5
0;EP3EP3E"
290 P$="AD9FC00439":X1=&H0E00:GO
SUB190
295 P$="347FBDB3ED338D002D33CB10
AE8D00236F8D00211F31A68D001B8155
270EEC81EDA1A684A7A06C8D000B20E8
A684A7A4357F39040000DB6DB6DB6D00
0000FFFFFF":X1=&H0E0A:GOSUB190
300 P$="343FBDB3EDBEC006A7028609
3D4C5CE7031F02AD9FC004E6062710E6
02C1112605CC0002200ECC000120091F
20810926DCCC0000BDB4F4353F39":X1
=&H0E86:GOSUB190:P$=""
305 M1$="<ANY> TO CONTINUE
       ":M2$="<ANY> TO RESTART O
R QUIT      "
310 PRINT@I1,M1$;
315 PRINT@I3,"PLEASE TURN UP VOL
```

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```
UME ON TV    ";:FORX=1TO150:NEXT:
PLAYE$:K$=INKEY$:IFK$=""THEN320E
LSEGOSUB170:GOSUB255:GOSUB265:GO
SUB200:GOTO350
320 PRINT@I3,"please";B$;"turn";
B$;"up";B$;"volume";B$;"on";B$;"
tv";B$;B$;B$;:FORX=1TO150:NEXT:P
LAYA$:GOTO315
325 'dir error abort point.....
330 PRINT@I3,"DIR. TRACK ERROR-C
AN'T CONTIN.";:IFP=1THENGOSUB225
:PRINT#-2,"DIR. TRACK ERROR-CANN
OT CONTINUE-DISK NOT USABLE OR U
NFORMATTED":PLAYE$ELSEPLAYE$
335 'restart point.............
340 PRINT@I1,M2$;:GOSUB70:CLSBC
345 'start point...............
350 GOSUB180:PRINT@I1,"<C>OMMENC
E TEST   <Q>UIT        ";:PRINT@I3
,"INSERT OR CHANGE DISKETTES
";:PLAYA$
355 GOSUB70:IFK$="C"THENGOSUB170
:GOSUB215:GOTO365ELSEIFK$="Q"THE
NGOSUB170:PRINT@I3-33,"";:ENDELS
EPLAYE$:GOTO355
360 'file check................
365 GOSUB170:PRINT@357,"OPERATIO
N: FILE CHECK ";:T1=17:S1=2:O1=2
:GOSUB35:IFEC<>0THEN330ELSE370
370 X1=1:FORX2=0TO67:G(X2)=PEEK(
B+X2):IFG(X2)<>&HFF THENX1=0
375 NEXT:IFX1=1THENPRINT@I3,"NO
FILES        ";:GOTO390
380 PRINT@I3,"files present  ";
385 'directory check...........
390 T1=17:S1=3:O1=2:GOSUB35:IFEC
<>0THEN330
395 'log check.................
400 LF=1:FORX2=0TO7:IFASC(MID$(L
N$,X2+1,1))<>PEEK(B+X2)THENLF=0
405 NEXTX2:IFLF=1THENPRINT@I3+15
,"LOG PRESENT     ";ELSEPRINT@I3+
15,"NO DEFECT LOG  ";
410 PRINT@I1,"<C>ONTINUE  <OTHER
>ABORT TEST ";:PLAYA$
415 GOSUB70:IFK$="C"THENGOSUB170
:GOTO425ELSECLSBC:GOTO350
420 'log array prep............
425 IFLF=0THEN435ELSEX1=PEEK(B+1
3)
430 X2=G(X1):G(X1)=&HB9:IFX2>=&H
C0 AND X2<=&HC9 THEN435ELSEIFX2<
=67THENX1=X2:GOTO430ELSEPRINT@I3
,"ERROR IN LOG - WILL TEST ALL
";:PLAYE$:LF=0:GOSUB80
435 FORX2=0TO67:IFLF=0THENX1=&HF
```

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```
F:GOTO440ELSEIFG(X2)=&HB9 THENX1
=&HB9:GOTO440ELSEX1=&HFF
440 G(X2)=X1:NEXT
445 'first declare point.......
450 GOSUB100:M3$="first ":GOSUB1
10
455 'test sequence.............
460 DATA0,34,2,0,3,33,1,-2,1,3,0
,0,1,0,0,1,33,2,1,2,34,0,-2,0,2,
1,33,2,2,3,34,0,-2,1,3,0,34,2,1,
2,33,1,-2,2,2,0,34,2,2,3,33,1,-2
,0,3,0,0,1,0,0,1,33,2,0,2,34,0,-
2,2,2
465 DATA0,34,2,8,3,33,1,-2,5,3,0
,0,1,0,0,1,33,2,5,2,34,0,-2,8,2,
1,33,2,8,3,34,0,-2,5,3,0,34,2,5,
2,33,1,-2,8,2
470 DATA17,17,1,8,3
475 'DATA0,3,1,0,2
480 DATA99,0,0,0,0
485 CLSBC:X1=.75:RESTORE:FORX=67
TO34STEP-1:G(X+2)=G(X):NEXT:DE=0
:G(34)=&HFF:G(35)=&HFF
490 IFT$="Sh"THENFORX=1TO70:READ
OP:NEXTX
495 READ TI,TE,ST,PA,OP:IFDE=1TH
EN565ELSEIFTI=99THENFORX=36TO69:
G(X-2)=G(X):NEXT:GOTO555ELSEIFOP
=3THENX=USR1(PA):GOTO500ELSEIFOP
=0THENO1=2:T1=TI:S1=1:GOSUB35:GO
TO495
500 O1=OP:X1=X1+.25:PRINT@295,"
    CYCLE:          ";:PRINT@327,"
    TRACK:          ";:PRINT@359,"
  granule:          ";:PRINT@391,"
OPERATION:          ";:PRINT@423,ST
RING$(18,32);
505 POKEPP,O1
510 FORT1=TI TO TE STEP ST:PRINT
@307,USING"##";INT(X1);:PRINT@33
9,USING"##";T1;:IFOP=2THENPRINT@
403,"READ ";ELSEPRINT@403,"WRITE
";
515 FORX2=0TO1:PG=2*T1+X2
520 G1=2*T1+X2:IFT1>17THENG1=G1-
2
525 IFT1=17THENPRINT@371,"DIR";E
LSEPRINT@370,USING"### ";G1;
530 IFG(PG)=&HB9 ORG(PG)=&H99 OR
G(PG)=&HE9 THEN545
535 PRINT@423,STRING$(16,32);:X3
=256*T1+X2:EC=USR2(X3):IFEC=0THE
N545ELSEIFEC=2THENX2=1:T1=TE:DE=
1:GOTO540ELSEPRINT@423,"     BAD
GRANULE    ";:PLAYE$
540 G(PG)=&HE9
545 NEXTX2:NEXTT1:GOTO495
550 'final declare point.......
555 GOSUB100:M3$="final ":GOSUB1
10:CLSBC
560 'format allow table........
565 IFDE=1THEN330ELSEX=USR1(8):X
3=0:X2=0:X1=0
570 FORLG=0TO67:IFG(LG)=&H99 ORG
(LG)=&HB9 ORG(LG)=&HE9 THEN575EL
SE585
575 IFX3<>0THEN POKEB+X1,LG ELSE
X2=LG
580 X1=LG:X3=X3+1
585 NEXTLG:IFX3=0THEN590ELSEPOKE
B+X1,&HC9
590 T1=17:S1=2:O1=3:GOSUB35:FORX
4=1TO200:NEXTX4:IFEC<>0THEN330
595 'format dir entry..........
600 X=USR1(8):FORX=0TO10:POKEB+X
,ASC(MID$(LN$,X+1,1)):NEXT:POKEB
+11,1:POKEB+12,0:POKEB+13,X2:POK
EB+14,1:POKEB+15,0:IFX3=0THENPOK
EB,0
605 T1=17:S1=3:O1=3:GOSUB35:FORX
4=1TO200:NEXTX4:IFEC<>0THEN330
610 GOSUB90:PRINT@I3,"test cplt
- FINAL DEFECT LIST ";:FORX=0TO6
7:IFG(X)<>&HFF THENGOSUB45
615 NEXTX
620 IFP=1THENGOSUB225:GOSUB235
625 PLAYA$:GOTO340
```

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A Simple Text Processor

By Ashok Basargekar

One of my favorite hobbies is to improve the Color Computer software written by others in my favorite RAINBOW magazine, give it a personal touch and enjoy the results. I remember Mr. Lewandowski's series of articles on the simple text handling program. I used to read the articles, enhance them to my satisfaction and wait for his next installment. After waiting for several months for him to give me some hints on the *EDIT* feature of his text handling program, I decided to take on this task myself.

Before going into the *EDIT* feature, I would like to present a complete face lift that I have given to the other subroutines of the text handler.

The first six lines of my assembly language source code define the ROM routines I will be using. The next 14 lines are the direct page addresses that I will be using to store my constants and variables. I may use a portion of the direct page; that's what the *Getting Started with Color BASIC* manual says! The START of my program uses the auto key repeat feature, published by Roger Schrag in his article on "Super Patched EDTASM". At START1 I release the alpha lock so I start my text processor with lowercase letters. In WIPE, I clear all the text buffer and then branch to FIN1 for my new menu. I beg your pardon, Mr. Lewandowski, I have used my name instead of yours, in the MES1. Instead of using LINPUT routine for text handling, I have made it character-oriented in CONT for continue. I thought that the original PAPER routine was very primitive, so I changed it to give me the top of the form, left margin, line width and line spacing selections. First I take the characters up to the line width and go back to the nearest place where I can break a word before going to the next line. The *CLOAD, CSAVE, LOAD* and *SAVE* routines are the gifts of Roger Schrag from his disk and tape I/O routines. Before I go to the LINPUT for filename, I lock the alpha lock, so that the filename is always in capital letters. The EXIT routine also does the same thing. Finally I come to my *EDIT* routine for some comments.

> ***"The Compose mode allows you to compose a new text, or to append a typed or loaded text from a tape or disk. Words will not wrap around to the next line while typing, but they will be properly moved to the next line at the time of printing on a paper."***

Here I have used the same memory locations that I used to store the constants of PAPER routine in the direct page. SCL is used to store the text buffer address that will equate to the top left corner of the video screen. MARGIN stores the text buffer address that equates to the bottom right corner of the video screen. These addresses are revised as soon as the Y register (cursor pointer) goes beyond $400-$5FF range. Before bringing the next portion of the text for editing, all the previous buffer area is revised to match the screen

(Ashok Basargekar, a civil engineer in California, has developed an interest in computer science as a hobby. He has developed some programs in civil engineering subjects on CP/M. He received his Bachelor's degree in civil engineering from Baroda University in India and further courses in civil engineering and computer languages at California State University in Long Beach, Calif., Polytechnic University, Pomona and Santa Ana College in Santa Ana, Calif.)

buffer. The COPY routine brings a copy of a portion of text in video screen for editing and the REVISE routine sends the edited text from screen to the text buffer. The NXTPGE and PRVPGE routines change the SCL and MARGIN addresses of next page or previous page depending upon the cursor movement. The DELETE routine moves all the text one to the left when the CLEAR key is pressed. The INSERT routine moves all the text one to the right for making room for a character in the middle.

I have used Spectral Associates' *ULTRA 80C* for editing and assembling this program. Of course, you may use any other assembler you wish. Since I have installed the *Lower-Kit,* by Green Mountain Micro, in my CoCo, the entire text is very beautiful on the screen.

The entire machine language code resides from $E00 through $16D4 and for a 32K computer, you will have plenty of text buffer area from $16D5 through $7FFF. The program is completely position independent except the address table for the menu subroutines. The control keys and procedure in using my *Text Processor* are as follows:

Initialization

LOADM"TEXT PRO" and *EXEC* will access this program. You will get a complete menu of selection as follows:

1) COMPOSE

The Compose mode allows you to compose a new text, or to append a typed or loaded text from a tape or disk. Words will not wrap around to the next line while typing, but they will be properly moved to the next line at the time of printing on a paper. Any immediate mistakes can be corrected by moving the cursor backward, with the left arrow key. Once you exit this Composing mode, and return back for continuing the text, you will not be able to correct the previously typed text with the left arrow key. You will need to go to the Edit mode for this purpose. While composing the text, do not press the ENTER key unless you want to go to the next line for a new paragraph. Pressing ENTER will provide a hard carriage return when printing the text on a printer. To exit the Composing mode, simply hit the BREAK key. You will return back to the main menu of selections.

2) EDIT

The text in the Edit mode appears slightly different from that in the Composing mode. You will see a red block at the places you have pressed the ENTER key, for providing a hard carriage return for a new paragraph. The up, down, right and left arrow keys will move the cursor anywhere in the text, while in the Edit mode. The CLEAR key will delete one character at a time. The SHIFT-CLEAR keys will allow you to insert any text in the middle. The flashing cursor will disappear when you are in the Insert mode. You will return back to the Edit mode by pressing the BREAK key. You will exit the Edit mode by pressing the BREAK key again. The text can also be appended at the end while you are in the Insert mode. To revise the text in the Edit mode, simply write new text over the existing text.

> ***". . .Simply enter the desired printing specifications for total line width, left margin and line spacing. Your text will be printed on the paper according to your specifications."***

---

3) CLOAD

This selection will allow you to load a text from a cassette tape. The text can be loaded at the end of any typed or other-loaded text, allowing you to merge two or more texts.

4) DLOAD

This selection will allow you to load any text from a disk. You will be asked to enter a filename. The filename must be the entire name including the extension. If the filename is not found, or if the file is on a bad disk, you will receive an error message number. If so, simply press any key to go back to the main menu. Refer to Table 1 for the type of error.

5) PRINT

The underlining codes are presently set for the Brother Correctronic 50 typewriter. The Baud rate is set at 1200. Simply enter the desired printing specifications for total line width, left margin and line spacing. Your text will be printed on the paper according to your specifications. The paper will advance to the new page after printing 60 lines. Therefore, adjust the paper so that three blank lines are left at the top. This will provide three blank lines at the bottom. To change the printer Baud rate and printable lines per page or to change the underlining codes, you will need the following corrections to the software before executing the program.

POKE &HF74, msb : POKE &HF75, lsb of Baud rate constants.

POKE &H100D, n where n = printable lines per page.

POKE &H1016, m where m = blank lines at top and bottom of page.

POKE &H102C, 27 : POKE &H1031, 45 for start of underlining codes for Brother.

POKE &H1037, 27 : POKE &H103C, 82 for end of underlining codes for Brother.

POKE &H102C, 32 : POKE &H1031, 15 for start of underlining codes of LP VIII

POKE &H1037, 14 : POKE &H103C, 32 for end of underlining codes of LP VIII

6) CSAVE

This routine will allow you to save the text on a cassette tape.

7) DSAVE

This subroutine will allow you to save the text on a disk. You will be asked for a filename. It must be up to eight characters in length with an extension up to three characters. If an extension is not specified, none will be assumed. Therefore, give a filename like: *TEXT/DAT* or *TEXT.TXT*, etc.

The codes for the error messages while reading or writing text from or to the disk are as follows:

TABLE 1

CODE	TYPE OF ERROR
19	File already open
20	Bad device or drive number
21	I/O error
22	FM error
23	File not open
24	Input past end of line
27	File not found
29	Disk full
30	Out of buffer space
31	Disk write protected
32	Bad filename
33	Bad file structure
37	Verification error

8) EXIT

This will exit to BASIC. You will lose all the text with this selection. Therefore, make sure that the text is saved on the tape or disk prior to selecting EXIT.

Happy text processing! If you have any questions or suggestions regarding my text processor please drop a line with a SASE to Ashok Basargekar, 1423 North Cleveland Street, Orange, CA 92667, (714) 639-3996.

The listing:

```
                00010 ***********************************
                00020 * A SIMPLE TEXT PROCESSOR         *
                00030 * BY ASHOK BASARGEKAR.            *
                00040 * 1423 NORTH CLEVELAND STREET,    *
                00050 * ORANGE, CA. 92667.              *
                00060 ***********************************
                00061 *
                00070 * MAJOR ROM ROUTINES USED BY THIS PROGRAM.
                00071 *
      A928      00080 CLS     EQU $A928 Clear screen.
      A30A      00090 SCREEN  EQU $A30A Print on screen.
      A393      00100 LINPUT  EQU $A393 Line input.
      A2BF      00110 PRNTR   EQU $A2BF Print on printer.
      A1C1      00120 INKYS   EQU $A1C1 INKEY$
      A027      00130 QUIT    EQU $A027 Back to Basic.
      A7D3      00140 DELAY   EQU $A7D3 Delav until X=0
                00141 *
                00142 * Constants & variables stored in Direct Page.
                00143 *
      0000      00150 KCLEAR  EQU $0 Auto key repeat
      0001      00160 KHOLD   EQU $1 constants.
      0002      00170 BUFST   EQU $2 Start of text buffer addtess.
      0004      00180 BUFEN   EQU $4 End of text buffer address.
      0006      00190 SCL     EQU $6 Start of current line.
      0008      00200 MARGIN  EQU $8 Left margin.
      0009      00210 LW      EQU $9 Line width.
      000A      00220 CLW     EQU $0A Current line width.
      000B      00230 SPACE   EQU $0B Line spacing.
      000C      00240 LCP     EQU $0C Line counter of page.
      000D      00250 LENGTH  EQU $0D Length of filename.
      000E      00260 DSAVE   EQU $0E Tape/disk error vector.
      0011      00270 STACK   EQU $11 Tape/disk stack pointer.
                00280 *
0E00            00290         ORG $E00
                00300 *
                00310 * Following interrupt service routine is similar to one
                00320 * in Rainbow Sept 83, page 77
                00330 *
0E00 30   8C 0B 00340 START   LEAX <NMI.PCR
0E03 BF   010A  00350         STX $10A
0E06 30   8C 13 00360         LEAX <IRQ.PCR
0E09 BF   010D  00370         STX $10D
0E0C 20   62    00380         BRA START1
0E0E B6   0982  00390 NMI     LDA $982
0E11 27   5C    00400         BEQ REPOUT
0E13 BE   0983  00410         LDX $983
0E16 AF   6A    00420         STX $0A,S
0E18 7F   0982  00430         CLR $982
0E1B 3B         00440         RTI
0E1C B6   FF03  00450 IRQ     LDA $FF03
0E1F 2A   4E    00460         BPL REPOUT
0E21 B6   FF02  00470         LDA $FF02
0E24 B6   0985  00480         LDA $985
0E27 27   10    00490         BEQ REPEAT
0E29 7A   0985  00500         DEC $985
0E2C 26   0B    00510         BNE REPEAT
0E2E B6   0986  00520         LDA $986
0E31 84   B0    00530         ANDA #$B0
0E33 B7   0986  00540         STA $986
0E36 B7   FF40  00550         STA $FF40
0E39 8E   0152  00560 REPEAT  LDX #$152
0E3C A6   80    00570 RP1     LDA ,X+
0E3E 81   FF    00580         CMPA #$FF
0E40 26   13    00590         BNE RP2
0E42 8C   015A  00600         CMPX #$15A
0E45 26   F5    00610         BNE RP1
0E47 0C   00    00620         INC <KCLEAR
0E49 96   00    00630         LDA <KCLEAR
0E4B 81   06    00640         CMPA #$6
0E4D 26   20    00650         BNE REPOUT
0E4F 0F   00    00660         CLR <KCLEAR
0E51 0F   01    00670         CLR <KHOLD
0E53 20   1A    00680         BRA REPOUT
0E55 0C   01    00690 RP2     INC <KHOLD
0E57 96   01    00700         LDA <KHOLD
0E59 81   1E    00710         CMPA #$1E
0E5B 26   12    00720         BNE REPOUT
0E5D 80   03    00730         SUBA #$3
0E5F 97   01    00740         STA <KHOLD
0E61 8E   0152  00750         LDX #$152
0E64 A6   84    00760 RP3     LDA ,X
0E66 8A   3F    00770         ORA #$3F
0E68 A7   80    00780         STA ,X+
0E6A 8C   015A  00790         CMPX #$15A
0E6D 26   F5    00800         BNE RP3
```

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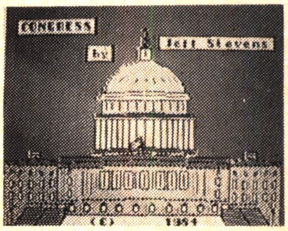

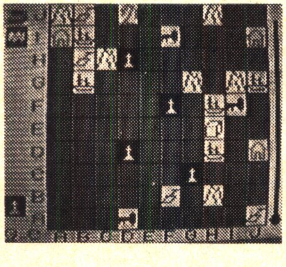

RECESS GAMES

A superb Christmas gift! Four Games in one program provide an enjoyable format for using higher level thinking skills. Players must reason logically while playing Treasure Hunt, Masterbrain, Tic Tac Toe, and Number Guess. Children use co-ordinates and a hot/cold thermometer to find a treasure hidden behind a grid. Number Guess includes an optional use of a number line to help children approximate answers. In Masterbrain, players must consider the many possible ways to arrange specific digits to build numbers. Tic Tac Toe encourages children to predict and plan sequential moves. All games are multi-leveled so children of different ages can play the same game. One and two player options — Large graphic numerals — Attractive Screen Displays.

Grades 2-8
16K Cass.(2) - $19.95
32K Disk - $21.95

SPELLING

Add zest to the basics! **Spelling** allows you to input your own words and save them on data files (tape or disk). You may also purchase ready made data files (below). During the lesson a word flashes on the screen, and the student then types the word. If the word is misspelled, the correct spelling appears and aligns itself underneath the misspelling. The student can quickly determine the error and correct it. The score is given continuously, and all misspelled words are given at the end. A graphic display of superlative words and song provide a reward. Printer use is optional. **Spelling** will accept words with apostrophes, hyphens, and spaces. Word lists may be easily edited.

Grades 2-8.
16K Cass. - $19.95
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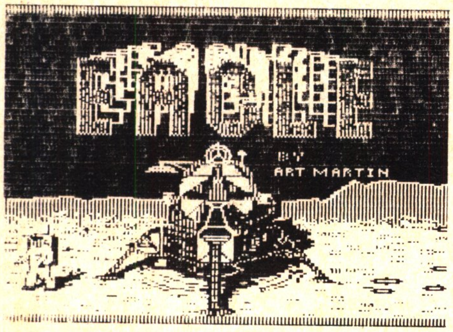

EAGLE

A graphic-enhanced lunar lander simulator. The pilot breaks out of lunar orbit and attempts a soft landing on the lunar surface. Joysticks control thrust and craft altitude and information is continually displayed on horizontal and vertical velocities, acceleration values, vertical and horizontal distances from target, fuel consumption and much more. On advanced levels, problems such as fuel leaks and computer screen failures can provide hair-raising final approaches. Disk version allows choice of landing site between Mars and Earth's moon. Takeoffs from the surface can be made and the upper stage placed back in orbit. The simulation is as educational as it is fun and exciting. A great tool for that future astronaut or physicist. 32K, 2 joysticks required. Available in tape or an enhanced disk version.

Tape - $24.95 Disk or Amdek - $29.95

SKETCHPAD

Sketchpad is a graphics drawing program designed to provide the computer hobbyist with easy manipulation of the powerful graphics capabilities of the Coco. Advanced programmers can design graphics screens and characters for Basic and ML programs and games. Sketchpad was used to create the graphics for "Eagle."

Two joysticks control cursors that provide endpoints and boundaries for lines, boxes, circles, ellipses and painting. Point-to-point drawstrings may be plotted on the screen and then rotated, enlarged or shrunk, moved or inverted. Patterns may be programmed in easily to create dazzling illusions using lines, boxes, circles, ellipses and drawstrings. Sketchpad supports all PMODES and color sets and gives false colors in Pmodes 1 and 4. Text and graphics can be combined on high-resolution screens. Animation is possible with up to 12 pages allowed in low-resolution and 3 full screens in high resolution. All pictures and drawstrings can be saved to disk for future use. 32K, 2 joysticks required. Disk only.

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The Digestive System

An educational quiz game for 2 players covering different areas of the human digestive system. Each question is assigned a point value relative to its difficulty. A fun way to learn about a serious subject. 16K.

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Using the same format as "The Digestive System," this program covers the heart, lungs, veins, arteries, blood, etc. 16K.

BOTH ONLY:

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GAMES

OTHXO

Othello® machine language game for the 16K Co-Co. 2 modes of play - you against a friend or you against the computer. When playing the computer, it will play hard or easy. In either, you had better think hard! Object of the game is to change the opponent's spots to yours by placing your marker at the end of a row started by your marker. Not as easy as it sounds! Tape, $24.95. Disk or Amdek, $29.95

Co-Co Keno

Bring Las Vegas' Keno game home with Co-Co Keno. Bet $1, $3 or $5 & mark off 1 to 15 spots...can you beat the odds & win $50,000? 16K, high resolution screen. Keno chart print included. Tape - $24.95. Disk or Amdek - $29.95.

Ultimate Bingo

The ultimate in Bingo! Use your LP 7 or 8 to print the number of cards you desire. Choose from 3 speeds of play & even pause the game to check winner's card.

Jackpot

Pull the one-arm bandit's arm - see if you can beat the odds!

Both Only

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Confusion

3 modes of play: 3-4, 5-6 or 7 letter words. You select time (30 or 60 seconds) to govern how long you get to unscramble the words. First person with ten correct wins! Tape - $19.95. Disk or Amdek - $24.95

EDUCATION

Kidstuff

Picture, Letter, or Number Association. Play an old-time tune with correct answer (7 songs), buzzes when wrong & waits for correct choice, 8 screens. Tape - $19.95. Disk - $24.95.

Stars Of America

Education should be fun - this program is just that! This tutorial uses 25 of the superstars of American history, from George Washington to Ronald Reagan.

The Civil War

A challenging two-person game. Questions cover Carpetbaggers to the Battle of Vicksburg. Points are assigned according to the difficulty of the question, scores are displayed throughout the game.

Both Only:
Tape $19.95 Disk $24.95

History From 1863 To 1976

On two 16K non-extended tapes. For 1-4 people. Informative & fun way to learn important dates in world history. Written for students by a teacher. Tape - $19.95. Disk or Amdek - $24.95.

MISCELLANEOUS

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Move-It!	Co-Co 1 Only	15.95

ADVENTURES

Treasure Hunt

A graphics text adventure. You walk with our graphics character through desert, mountains and city to seek the illusive treasure of gold. Super graphics with a person who walks with you at each turn. Disk & Amdek only - $29.95

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This year is 4001 A.D. You are a cargo trucker delivering a load in the Dorfian star system. Your mission is to get back to your home planet of Irat, alive. Can you survive the journey? Tape - $24.95. Disk or Amdek - $29.95.

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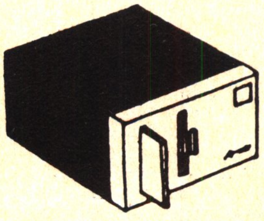

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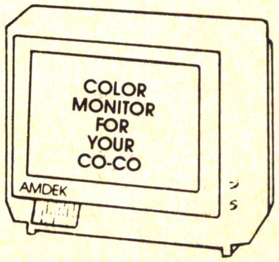

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```
0E6F 3B             00810 REPOUT  RTI
                    00820 *
                    00830 * Entry to the main program with alpha lock released and
                    00840 * all text buffer cleared.
                    00850 *
0E70 7F   011A      00860 START1  CLR $11A
0E73 31   8D 0857   00870         LEAY BUFF,PCR
0E77 109F 02        00880         STY <BUFST
0E7A 109F 04        00890         STY <BUFEN
0E7D 86   00        00900         LDA #0
0E7F A7   A0        00910 WIPE    STA ,Y+
0E81 109C 25        00920         CMPY <$25 Top of RAM reached?
0E84 26   F9        00930         BNE WIPE
0E86 20   70        00940         BRA FIN1
                    00950 *
                    00960 * Print on screen routine.
                    00970 * Printing continues until a zero byte is reached.
                    00980 *
0E88 A6   80        00990 PRINT   LDA ,X+
0E8A 27   05        01000         BEQ DONE
0E8C BD   A30A      01010         JSR SCREEN
0E8F 20   F7        01020         BRA PRINT
0E91 39             01030 DONE    RTS
                    01040 *
                    01050 * Routine to continue with the text one character at a time
                    01060 * at the end of previous text.
                    01070 *
0E92 109E 04        01080 CONT    LDY <BUFEN
0E95 34   20        01090         PSHS Y
                    01100 *
                    01110 * Make sure that the flashing cursor does not go below
                    01111 * $400 the top left corner of video screen.
                    01120 *
0E97 9E   88        01140 FLASH   LDX <$88
0E99 8C   0400      01150         CMPX #$0400
0E9C 24   04        01160         BHS J1
0E9E 0C   89        01170         INC <$89
0EA0 20   F5        01180         BRA FLASH
                    01181 *
                    01182 * Alternately place a black ($80) and green ($8F) cursor
                    01183 * until a key is pressed.
                    01184 *
0EA2 86   80        01190 J1      LDA #$80 Get a black cursor.
0EA4 8D   45        01200         BSR KBSCAN
0EA6 26   06        01210         BNE J2  Go to J2 if key pressed.
0EA8 86   8F        01220         LDA #$8F Wipe cursor with green.
0EAA 8D   3F        01230         BSR KBSCAN
0EAC 27   E9        01240         BEQ FLASH Zero means no key pressed.
                    01241 *
                    01242 * Place a character on screen until BREAK is presed.
                    01243 *
0EAE 81   03        01250 J2      CMPA #$03 BREAK?
0EB0 26   0B        01260         BNE J3
0EB2 86   00        01270         LDA #$0
0EB4 35   20        01280         PULS Y
0EB6 A7   A4        01290         STA ,Y
0EB8 109F 04        01300         STY <BUFEN
0EBB 20   3B        01310         BRA FIN1 Go to main menu routine.
                    01311 * If Back Space key is pressed, J4 makes it sure that
                    01312 * Y reg. is >=BUFEN of previously typed or loaded text.
                    01313 * J5 revises the text buffer address pointer and echoes
                    01314 * back space to screen. J6 ignores CLEAR key.
0EBD 81   08        01320 J3      CMPA #$8
0EBF 26   1B        01330         BNE J6
0EC1 86   8F        01340         LDA #$8F
0EC3 A7   9F 0088   01350         STA [$88]
0EC7 35   20        01360         PULS Y
0EC9 31   3F        01370         LEAY -1,Y
0ECB 109C 04        01380 J4      CMPY <BUFEN
0ECE 24   04        01390         BHS J5
0ED0 31   21        01400         LEAY 1,Y
0ED2 20   F7        01410         BRA J4
0ED4 86   00        01420 J5      LDA #$0
0ED6 A7   A4        01430         STA ,Y
0ED8 34   20        01440         PSHS Y
0EDA 86   08        01450         LDA #$8
0EDC BD   A30A      01460 J6      JSR SCREEN
0EDF 81   0C        01470         CMPA #$0C
0EE1 23   B4        01480         BLS FLASH
0EE3 35   20        01490         PULS Y
0EE5 A7   A0        01500         STA ,Y+
0EE7 34   20        01510         PSHS Y
0EE9 20   AC        01520         BRA FLASH
                    01530 *
                    01540 * This routine scans key board for a press. Returns zero
                    01550 * if none pressed.
                    01551 *
0EEB A7   9F 0088   01560 KBSCAN  STA [$88]
0EEF BD   A1C1      01570 J7      JSR INKYS
0EF2 26   03        01580         BNE J8
0EF4 5A             01590         DECB
```

```
0EF5 26   F8        01600         BNE J7
0EF7 39             01610 J8      RTS
                    01620 *
                    01630 * Main menu selection routine.
                    01640 *
0EF8 BD   A928      01650 FIN1    JSR CLS
0EFB 30   8D 067E   01660         LEAX MES1,PCR
0EFF 8D   87        01670         BSR PRINT
0F01 BD   A1C1      01680 WAIT    JSR INKYS
0F04 27   FB        01690         BEQ WAIT
0F06 80   31        01700         SUBA #$31
0F08 25   F7        01710         BLO WAIT
0F0A 81   08        01720         CMPA #$8
0F0C 24   F3        01730         BHS WAIT
0F0E 48             01740         ASLA
0F0F 8E   0F19      01750         LDX #MENU
0F12 AE   86        01760         LDX A,X
                    01770 * X now points to the absolute address of jump
0F14 BF   0F2A      01780         STX BRANCH
0F17 20   10        01790         BRA JUMP
                    01800 *
                    01810 * Table of address of different routines.
                    01820 *
0F19      0F2C      01830 MENU    FDB REST
0F1B      130D      01840         FDB EDIT
0F1D      104F      01850         FDB CLOAD
0F1F      11BD      01860         FDB LOAD
0F21      0F3B      01870         FDB PAPER
0F23      1173      01880         FDB SAVE
0F25      1173      01890         FDB SAVE
0F27      116E      01900         FDB EXIT
0F29      7E        01910 JUMP    FCB $7E
0F2A      0000      01920 BRANCH  FDB 0
                    01930 *
                    01940 * This routine prints all the text until end and goes
                    01950 * for continuation.
                    01960 *
0F2C BD   A928      01970 REST    JSR CLS
0F2F 9E   02        01980         LDX <BUFST
0F31 17   FF54      01990         LBSR PRINT
0F34 30   1F        02000         LEAX -1,X
0F36 9F   04        02010         STX <BUFEN
0F38 16   FF57      02020         LBRA CONT
                    02030 *
                    02040 * This routine gets the user specifications for printing
                    02050 * on printer and stores in the direct page.
                    02060 * The location SCL is used for temporary storage of each
                    02070 * user input.
                    02080 *
0F3B BD   A928      02090 PAPER   JSR CLS
0F3E 0F   0C        02100         CLR <LCP
0F40 30   8D 0708   02110         LEAX MES4,PCR
0F44 17   FF41      02120         LBSR PRINT
0F47 8D   31        02130         BSR SPECS
0F49 96   06        02140         LDA <SCL
0F4B 97   09        02150         STA <LW
0F4D 17   FF38      02160         LBSR PRINT
0F50 8D   28        02170         BSR SPECS
0F52 96   06        02180         LDA <SCL
0F54 97   08        02190         STA <MARGIN
0F56 96   09        02200         LDA <LW
0F58 90   08        02210         SUBA <MARGIN
0F5A 97   09        02220         STA <LW
0F5C 17   FF29      02230         LBSR PRINT
0F5F 8D   19        02240         BSR SPECS
0F61 96   06        02250         LDA <SCL
0F63 97   0B        02260         STA <SPACE
0F65 17   FF20      02270         LBSR PRINT
0F68 BD   A1C1      02280 L1      JSR INKYS
0F6B 81   03        02290         CMPA #$03
0F6D 27   89        02300         BEQ FIN1
0F6F 81   0D        02310         CMPA #$0D
0F71 26   F5        02320         BNE L1
0F73 8E   0029      02330         LDX #$0029  Baud Rate = 1200
0F76 9F   95        02340         STX <$95
0F78 20   33        02350         BRA GO
                    02360 *
                    02370 * This subroutine gets the user input of specifications,
                    02380 * converts from decimal to Hex number and returns in SCL
                    02390 *
0F7A 0F   06        02400 SPECS   CLR <SCL
0F7C 86   80        02410 L0      LDA #$80
0F7E 17   FF6A      02420         LBSR KBSCAN
0F81 26   07        02430         BNE L2
0F83 86   8F        02440         LDA #$8F
0F85 17   FF63      02450         LBSR KBSCAN
0F88 27   F2        02460         BEQ L0
0F8A 81   0D        02470 L2      CMPA #$0D
0F8C 26   01        02480         BNE L3
0F8E 39             02490         RTS
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0F8F 81    30       02500 L3      CMPA #$30
0F91 25    E9       02510         BLO L0
0F93 81    39       02520         CMPA #$39
0F95 22    E5       02530         BHI L0
0F97 BD    A30A     02540         JSR SCREEN
0F9A 80    30       02550         SUBA #$30
0F9C 0D    06       02560         TST <SCL
0F9E 26    04       02570         BNE L4
0FA0 97    06       02580 L6      STA <SCL
0FA2 20    D8       02590         BRA L0
0FA4 C6    0A       02600 L4      LDB #$0A
0FA6 9B    06       02610 L5      ADDA <SCL
0FA8 5A             02620         DECB
0FA9 26    FB       02630         BNE L5
0FAB 20    F3       02640         BRA L6
                    02650 *
                    02660 * This is the main entrv for printing text on printer.
                    02670 *
0FAD 9E    02       02700 GO      LDX <BUFST
                    02701 *
                    02702 * Start address of current line to be printed is stored
                    02703 * at SCL, no. of characters that can be printed within
                    02704 * selected line width and margin is determined and is
                    02705 * stored at CLW.
                    02706 *
0FAF 9F    06       02710 LP99    STX <SCL
0FB1 5F             02720         CLRB
0FB2 A6    80       02730 LP1     LDA ,X+
0FB4 27    28       02740         BEQ STORE
0FB6 81    0D       02750         CMPA #$0D     CR?
0FB8 27    24       02760         BEQ STORE
0FBA 5C             02770         INCB
0FBB D1    09       02780         CMPB <LW
0FBD 26    F3       02790         BNE LP1
0FBF 30    1F       02800         LEAX -1,X
0FC1 81    20       02810 LP2     CMPA #$20   SPACE?
0FC3 27    19       02820         BEQ STORE
0FC5 81    2E       02830         CMPA #$2E  PERIOD?
0FC7 27    15       02840         BEQ STORE
0FC9 81    21       02850         CMPA #$21
0FCB 27    11       02860         BEQ STORE
0FCD 81    3B       02870         CMPA #$3B
0FCF 27    0D       02880         BEQ STORE
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0FD1 81    2D       02890         CMPA #$2D
0FD3 27    09       02900         BEQ STORE
0FD5 81    3F       02910         CMPA #$3F
0FD7 27    05       02920         BEQ STORE
0FD9 A6    82       02930         LDA ,-X
0FDB 5A             02940         DECB
0FDC 20    E3       02950         BRA LP2
0FDE D7    0A       02960 STORE   STB <CLW
                    02970 *
                    02980 * Main routine for printing a line on printer.
                    02990 *
0FE0 C6    FE       03000         LDB #$FE Device #-2
0FE2 D7    6F       03010         STB <$6F
0FE4 9E    06       03020         LDX <SCL
                    03021 * Print specified left margin if any.
0FE6 D6    08       03030         LDB <MARGIN
0FE8 27    08       03040         BEQ LP4
0FEA 86    20       03050         LDA #$20
0FEC BD    A2BF     03060 LP3     JSR PRNTR
0FEF 5A             03070         DECB
0FF0 26    FA       03080         BNE LP3
0FF2 D6    0A       03090 LP4     LDB <CLW
0FF4 A6    80       03100 LP13    LDA ,X+
0FF6 81    00       03110         CMPA #$00
0FF8 27    4B       03120         BEQ LP5
0FFA 81    0D       03130         CMPA #$0D
0FFC 26    25       03140         BNE LP6
                    03150 *
                    03160 * This routine sends line feeds equal to spacing selected,
                    03170 * after printing each line.
                    03180 *
0FFE D6    0B       03190 LP14    LDB <SPACE
1000 26    01       03200         BNE LP7
1002 5C             03210         INCB
1003 86    0D       03220 LP7     LDA #$0D
1005 BD    A2BF     03230         JSR PRNTR
1008 0C    0C       03240         INC <LCP
100A 96    0C       03250         LDA <LCP
100C 81    3C       03260         CMPA #$3C       60 LINES?
100E 27    05       03270         BEQ LP8
1010 5A             03280         DECB
1011 26    F0       03290         BNE LP7
1013 20    9A       03300         BRA LP99
                    03310 *
                    03320 * This routine skips six lines after printing sixty lines
                    03330 * on each page and goes to new page.
                    03340 *
1015 C6    06       03350 LP8     LDB #6          6 BLANK LINES.
1017 86    0D       03360 LP10    LDA #$0D
1019 BD    A2BF     03370         JSR PRNTR
101C 5A             03380         DECB
101D 26    F8       03390         BNE LP10
101F 0F    0C       03400         CLR <LCP
1021 20    8C       03410         BRA LP99
                    03420 * This routine prints one character at a time on printer.
                    03430 * Check is made for special printer commands for underlining.
                    03440 *
1023 81    20       03450 LP6     CMPA #$20
1025 27    16       03460         BEQ LP11
1027 81    3C       03470         CMPA #$3C       <?
1029 26    07       03480         BNE LP12
102B 86    1B       03490         LDA #$1B
102D BD    A2BF     03500         JSR PRNTR
1030 86    45       03510         LDA #$45
1032 81    3E       03520 LP12    CMPA #$3E       >?
1034 26    07       03530         BNE LP11
1036 86    1B       03540         LDA #$1B
1038 BD    A2BF     03550         JSR PRNTR
103B 86    52       03560         LDA #$52
103D BD    A2BF     03570 LP11    JSR PRNTR
1040 5A             03580         DECB
1041 26    B1       03590         BNE LP13
1043 20    B9       03600         BRA LP14
                    03610 *
                    03620 * This routine sends final carriage return, changes device
                    03630 * code to screen and returns to main menu.
                    03640 *
1045 86    0D       03650 LP5     LDA #$0D
1047 BD    A2BF     03660         JSR PRNTR
104A 0F    6F       03670         CLR <$6F
104C 16    FEA9     03680         LBRA FIN1
                    03690 *
                    03700 * Load from cassette tape routine.
                    03710 * BREAK key will abort routine and will return to main menu.
                    03720 *
104F BD    A928     03730 CLOAD   JSR CLS
1052 30    8D 0667  03740         LEAX MES5,PCR
1056 17    FE2F     03750         LBSR PRINT
1059 BD    A1C1     03760 WAIT2   JSR INKYS
105C 27    FB       03770         BEQ WAIT2
```

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105E 81   03       03780         CMPA #$03
1060 1027 FE94     03790         LBEQ FIN1
                   03800 *
                   03810 * Tape load routine is similar to that in Oct.83 Rainbow
                   03820 * page 84
                   03830 *
1064 C6   FF       03840         LDB #$FF  Select motor on.
1066 17   00BB     03850         LBSR MOTOR
1069 1026 0286     03860         LBNE ERROR
106D AE   8D 049E  03870         LDX NONAME,PCR
1071 86   49       03880         LDA #$49   Select input from tape.
1073 C6   FF       03890         LDB #$FF   Select on screen.
1075 17   01C9     03900         LBSR COPEN
1078 1026 0277     03910         LBNE ERROR
107C 9E   04       03920         LDX <BUFEN
107E 17   0210     03930 LOOP4   LBSR CINPUT
1081 1026 026E     03940         LBNE ERROR
1085 A7   80       03950         STA ,X+
1087 4D            03960         TSTA
1088 26   F4       03970         BNE LOOP4
108A 30   1F       03980         LEAX -1,X
108C 9F   04       03990         STX <BUFEN
108E 17   01E0     04000         LBSR CCLOSE
1091 1026 025E     04010         LBNE ERROR
1095 C6   00       04020         LDB #$0   Select motor off.
1097 17   008A     04030         LBSR MOTOR
109A 1026 0255     04040         LBNE ERROR
109E 16   FE57     04050         LBRA FIN1
                   04060 *
                   04070 * Routine for user input of tape/disk filename.
                   04080 *
10A1 BD   A928     04090 NAME    JSR CLS
10A4 8E   02DD     04100         LDX #$2DD
10A7 CC   2055     04110         LDD #$2055
10AA A7   80       04120 LOOP2   STA ,X+
10AC 5A            04130         DECB
10AD 26   FB       04140         BNE LOOP2
10AF B6   011A     04150         LDA $11A
10B2 34   02       04160         PSHS A
10B4 86   FF       04170         LDA #$FF Set the alpha lock for
10B6 B7   011A     04180         STA $11A Capital letter filename.
10B9 30   8D 046E  04190 REDO    LEAX MES,PCR
10BD 17   FDC8     04200         LBSR PRINT
10C0 BD   A393     04210         JSP $A393   Get name.
10C3 D1   0D       04220         CMPB <LENGTH Valid length?
10C5 2E   F2       04230         BGT REDO Do it again if invalid.
10C7 35   04       04240         PULS B Reset the
10C9 F7   011A     04250         STB $11A alpha lock.
10CC 39            04260         RTS
                   04270 *
                   04280 * Routine to save text on cassette tape.
                   04290 * See Oct 83 Rainbow page 84
                   04300 *
10CD C6   09       04310 CSAVE   LDB #9
10CF D7   0D       04320         STB <LENGTH
10D1 8D   CE       04330         BSR NAME
10D3 30   8D 05E6  04340         LEAX MES5,PCR
10D7 17   FDAE     04350         LBSR PRINT
10DA BD   A1C1     04360 WAIT3   JSR $A1C1
10DD 27   FB       04370         BEQ WAIT3
10DF 81   03       04380         CMPA #$03
10E1 1027 FE13     04390         LBEQ FIN1
                   04400 * Main CSAVE routine.
10E5 C6   FF       04410         LDB #$FF   Select motor on.
10E7 8D   3B       04420         BSR MOTOR
10E9 1026 0206     04430         LBNE ERROR
10ED 8E   02DD     04440         LDX #$2DD   Point at name.
10F0 86   4F       04450         LDA #$4F   Select output to tape.
10F2 C6   FF       04460         LDB #$FF   Select on screen.
10F4 17   014A     04470         LBSR COPEN
10F7 1026 01FB     04480         LBNE ERROR
10FB 9E   02       04490         LDX <BUFST
10FD A6   80       04500 CLOOP   LDA ,X+   Read a character.
10FF 4D            04510         TSTA
1100 27   09       04520         BEQ SOUT
1102 17   017C     04530         LBSR CSTPRT
1105 1026 01EA     04540         LBNE ERROR
1109 20   F2       04550         BRA CLOOP
110B 17   0173     04560 SOUT    LBSR CSTPRT
110E 1026 01E1     04570         LBNE ERROR
1112 17   015C     04580         LBSR CCLOSE
1115 1026 01DA     04590         LBNE ERROR
1119 C6   00       04600         LDB #$0   Select motor off.
111B 8D   07       04610         BSR MOTOR
111D 1026 01D2     04620         LBNE ERROR
1121 16   FDD4     04630         LBRA FIN1
                   04640 *
                   04650 * This routine turns cassette motor on or off (B=0 : off)
                   04660 *
1124 17   01A7     04670 MOTOR   LBSR BEGIN
1127 5D            04680         TSTB
1128 26   06       04690         BNE MOTORN
112A BD   A7EB     04700         JSR $A7EB   Motor off.
112D 16   01C7     04710         LBRA L21
1130 BD   A7CA     04720 MOTORN  JSR $A7CA   Motor on.
1133 16   01C1     04730         LBRA L21
                   04740 *
                   04750 * Routine to process cassette file name.
                   04760 *
1136 D7   68       04770 CNAME   STB $68
1138 CE   01D1     04780         LDU #$1D1
113B 6F   C0       04790         CLR ,U+
113D C6   20       04800         LDB #$20
113F E7   C0       04810 CLEAR   STB ,U+
1141 1183 01DA     04820         CMPU #$1DA
1145 25   F8       04830         BLO CLEAR
1147 CE   01D2     04840         LDU #$1D2
114A E6   80       04850 PNAME   LDB ,X+
114C C1   20       04860         CMPB #$20
114E 25   0B       04870         BLO RETURN
1150 E7   C0       04880         STB ,U+
1152 7C   01D1     04890         INC $1D1
1155 1183 01DA     04900         CMPU #$1DA
1159 25   EF       04910         BLO PNAME
115B 39            04920 RETURN  RTS
                   04930 *
                   04940 * Abort save on tape/disk routines if text buffer is empty.
                   04950 *
115C BD   A928     04960 NOTXT   JSR CLS
115F 30   8D 040C  04970         LEAX ERMES,PCR
1163 17   FD22     04980         LBSR PRINT
1166 BD   A1C1     04990 WAIT4   JSR $A1C1
1169 27   FB       05000         BEQ WAIT4
116B 16   FD8A     05010         LBRA FIN1
                   05020 *
                   05030 * Exit to basic with a cold start restoring interrupts and
                   05040 * alpha lock.
                   05050 *
116E 0F   71       05060 EXIT    CLR <$71
1170 7E   A027     05070         JMP QUIT
                   05080 *
                   05090 * Save on tape/disk routines.
                   05100 *
1173 34   02       05110 SAVE    PSHS A
1175 DC   04       05120         LDD <BUFEN
1177 93   02       05130         SUBD <BUFST
1179 27   E1       05140         BEQ NOTXT
117B 35   02       05150         PULS A
117D 81   0A       05160         CMPA #10
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```
117F 1027 FF4A     05170          LBEQ CSAVE
                   05180 *
                   05190 * Disk save routines. Refer to July 83 Rainbow page 71
                   05200 *
1183 8D   2E       05210          BSR SETUP
1185 17   008D     05220          LBSR LABEL
1188 8E   02DD     05230          LDX #$2DD
118B 108E 01FF     05240          LDY #$1FF
118F 86   4F       05250          LDA #$4F
1191 C6   01       05260          LDB #$1
1193 17   00C9     05270          LBSR OPEN
1196 26   56       05280          BNE GOOFED
1198 30   8D 0532  05290          LEAX BUFF,PCR
119C A6   80       05300 WRITE    LDA ,X+
119E C6   01       05310          LDB #$1
11A0 17   00E5     05320          LBSR DSKPRT
11A3 26   49       05330          BNE GOOFED
11A5 81   00       05340          CMPA #$0
11A7 26   F3       05350          BNE WRITE
11A9 C6   01       05360          LDB #$1
11AB 17   00CA     05370          LBSR CLOSE
11AE 26   3E       05380          BNE GOOFED
11B0 16   FD45     05390          LBRA FIN1
                   05400 *
                   05410 * Routine to setup one buffer and verify on.
                   05420 *
11B3 C6   01       05430 SETUP    LDB #$1
11B5 8D   69       05440          BSR FILES
11B7 C6   01       05450          LDB #$1
11B9 17   00EB     05460          LBSR VERIFY
11BC 39            05470          RTS
                   05480 *
                   05490 * Routine to load a disk data file.
                   05500 *
11BD 8D   F4       05510 LOAD     BSR SETUP
11BF 8D   54       05520          BSR LABEL
11C1 8E   02DD     05530          LDX #$2DD
11C4 108E 01FF     05540          LDY #$1FF
11C8 86   49       05550          LDA #$49
11CA C6   01       05560          LDB #$1
11CC 17   0090     05570          LBSR OPEN
11CF 26   1D       05580          BNE GOOFED
11D1 9E   04       05590          LDX <BUFEN
11D3 C6   01       05600 READ     LDB #$1
11D5 17   00C4     05610          LBSR INPUT
11D8 26   14       05620          BNE GOOFED
11DA A7   80       05630          STA ,X+
11DC 81   00       05640          CMPA #$0
11DE 26   F3       05650          BNE READ
11E0 30   1F       05660          LEAX -1,X
11E2 9F   04       05670          STX <BUFEN
11E4 C6   01       05680          LDB #$1
11E6 17   008F     05690          LBSR CLOSE
11E9 26   03       05700          BNE GOOFED
11EB 16   FD0A     05710          LBRA FIN1
11EE 34   04       05720 GOOFED   PSHS B
11F0 BD   A928     05730          JSR CLS
11F3 35   04       05740          PULS B
11F5 30   8D 0318  05750          LEAX ERRMSG,PCR
11F9 17   FC8C     05760          LBSR PRINT
11FC 86   2F       05770          LDA #$2F
11FE 4C            05780 ERR      INCA
11FF C0   0A       05790          SUBB #$0A
1201 24   FB       05800          BCC ERR
1203 CB   3A       05810          ADDB #$3A
1205 BD   A30A     05820          JSR $A30A
1208 1F   98       05830          TFR B,A
120A BD   A30A     05840          JSR $A30A
120D BD   A1C1     05850 LL1      JSR INKYS
1210 27   FB       05860          BEQ LL1
1212 16   FCE3     05870          LBRA FIN1
                   05880 *
                   05890 * Routine to process disk filename.
                   05900 *
1215 34   34       05910 LABEL    PSHS B,X,Y
1217 C6   0D       05920          LDB #$0D
1219 D7   0D       05930          STB <LENGTH
121B 17   FE83     05940          LBSR NAME
121E 35   B4       05950          PULS PC,B,X,Y
                   05960 * Routine to setup disk system memory.
1220 17   00AB     05970 FILES    LBSR BEGIN
1223 34   04       05980          PSHS B
1225 BD   CA3B     05990          JSR $CA3B
1228 35   04       06000          PULS B
122A F7   095B     06010          STB $95B
122D CE   0928     06020          LDU #$928
1230 8E   0989     06030          LDX #$989
1233 6F   84       06040 DOBUF    CLR ,X
1235 AF   C1       06050          STX ,U++
1237 30   89 0119  06060          LEAX $119,X
123B 5A            06070          DECB
123C 22   F5       06080          BHI DOBUF
123E 16   00B6     06090          LBRA L21
                   06100 * Routine to open cassete file.
1241 17   008A     06110 COPEN    LBSR BEGIN
1244 17   FEEF     06120          LBSR CNAME
1247 81   49       06130          CMPA #$49
1249 27   07       06140          BEQ OPENI
124B 81   4F       06150          CMPA #$4F
124D 27   09       06160          BEQ OPENO
124F 7E   A616     06170          JMP $A616
1252 BD   A629     06180 OPENI    JSR $A629
1255 16   009F     06190          LBRA L21
1258 4F            06200 OPENO    CLRA
1259 BD   A65B     06210          JSR $A65B
125C 16   0098     06220          LBRA L21
                   06230 * Routine to open disk file.
125F 8D   6D       06240 OPEN     BSR BEGIN
1261 10BF 0957     06250          STY $957
1265 34   06       06260          PSHS D
1267 8D   45       06270          BSR FNAME
1269 35   06       06280          PULS D
126B BD   C468     06290          JSR $C468
126E 16   0086     06300          LBRA L21
                   06310 * Routine to close cassete tape file.
1271 8D   5B       06320 CCLOSE   BSR BEGIN
1273 BD   A437     06330          JSR $A437
1276 20   7F       06340          BRA L21
                   06350 * Routine to close disk file.
1278 8D   54       06360 CLOSE    BSR BEGIN
127A D7   6F       06370          STB $6F
127C BD   CA53     06380          JSR $CA53
127F 20   76       06390          BRA L21
                   06400 * Routine to write on tape.
1281 8D   4B       06410 CSTPRT   BSR BEGIN
1283 BD   A290     06420          JSR $A290
1286 20   6F       06430          BRA L21
                   06440 * Routine to write on disk.
1288 8D   44       06450 DSKPRT   BSR BEGIN
128A D7   6F       06460          STB $6F
128C BD   A282     06470          JSR $A282
128F 20   66       06480          BRA L21
                   06490 * Routine to read tape file.
1291 8D   3B       06500 CINPUT   BSR BEGIN
1293 0F   70       06510          CLR $70
1295 BD   A17F     06520          JSR $A17F
1298 A7   60       06530          STA 0,S
129A 20   5B       06540          BRA L21
                   06550 * Routine to read disk file.
129C 8D   30       06560 INPUT    BSR BEGIN
129E D7   6F       06570          STB $6F
12A0 BD   A176     06580          JSR $A176
12A3 A7   E4       06590          STA ,S
12A5 20   50       06600          BRA L21
                   06610 * Routine to set verify on.
12A7 8D   25       06620 VERIFY   BSR BEGIN
12A9 F7   0987     06630          STB $987
12AC 20   49       06640          BRA L21
                   06650 * Routine to process disk filename.
12AE C6   FF       06660 FNAME    LDB #$FF
12B0 5C            06670 GETLEN   INCB
12B1 A6   85       06680          LDA B,X
12B3 81   20       06690          CMPA #$20
12B5 24   F9       06700          BCC GETLEN
12B7 6F   E2       06710          CLR ,-S
12B9 B6   095A     06720          LDA $95A
12BC 97   EB       06730          STA $EB
12BE CE   094C     06740          LDU #$94C
12C1 86   20       06750          LDA #$20
12C3 A7   C0       06760 L22      STA ,U+
12C5 1183 0957     06770          CMPU #$957
12C9 26   F8       06780          BNE L22
12CB 7E   C8A4     06790          JMP $C8A4
                   06800 * Routine to prepare everything.(Registers,Error traps etc)
12CE 34   7A       06810 BEGIN    PSHS X,Y,U,DP,A
12D0 4F            06820          CLRA
12D1 1F   8B       06830          TFR A,DP
12D3 B6   018E     06840          LDA $18E
12D6 FE   018F     06850          LDU $18F
12D9 97   0E       06860          STA <DSAVE
12DB DF   11       06870          STU <$11
12DD 86   7E       06880          LDA #$7E
12DF 33   8D 0010  06890          LEAU ERROR,PCR
12E3 B7   018E     06900          STA $18E
12E6 FF   018F     06910          STU $18F
12E9 A6   E4       06920          LDA ,S
12EB 10DF 11       06930          STS <STACK
12EE EE   66       06940          LDU 6,S
12F0 6E   F8 08    06950          JMP [8,S]
                   06960 * Pass through this routine if error.
12F3 54            06970 ERROR    LSRB
12F4 5C            06980          INCB
12F5 20   03       06990          BRA L25
                   07000 * Pass through this if no error.
12F7 5F            07010 L21      CLRB
12F8 20   00       07020          BRA L25
                   07030 * Restore registers and return to caller.
12FA 96   0E       07040 L25      LDA <DSAVE
12FC DE   11       07050          LDU <$11
12FE B7   018E     07060          STA $18E
1301 FF   018F     07070          STU $18F
1304 10DE 11       07080          LDS <STACK
1307 35   7A       07090          PULS A,DP,U,Y,X
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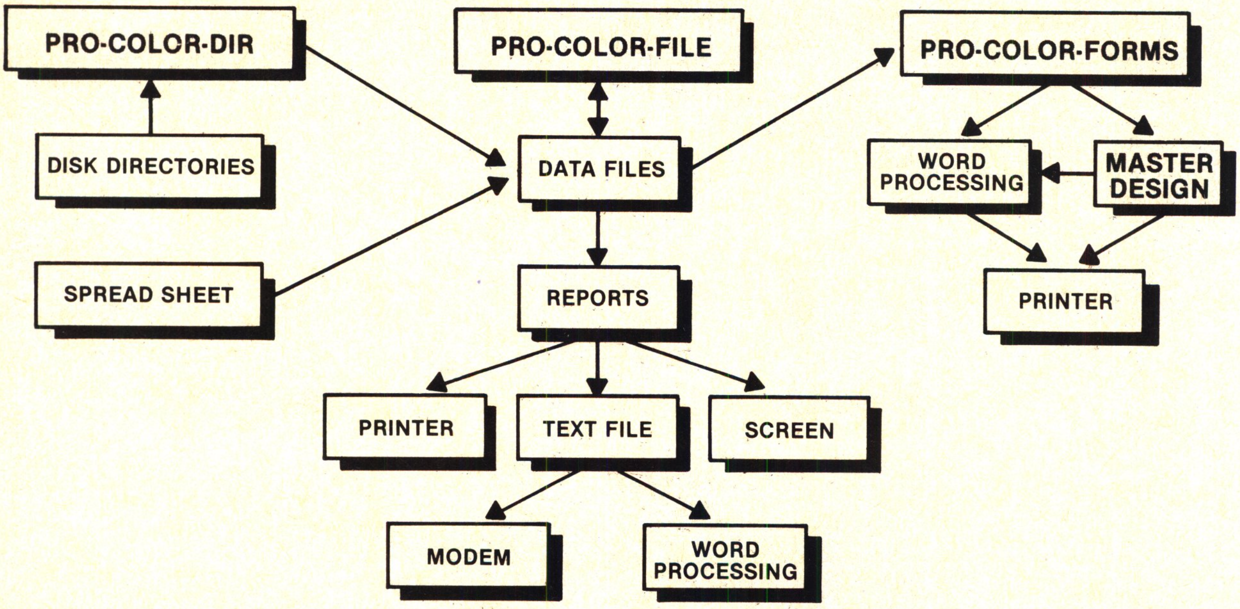
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```
1309 32   62       07100          LEAS 2,S
130B 5D            07110          TSTB
130C 39            07120          RTS
                   07130 * Edit routine uses video screen display area ($400-$5FF)
                   07140 * to display portions of text buffer for editing.
                   07150 * Editor uses direct page addresses as follows:
                   07160 * CLW : Cursor address upon entry to new screen page.
                   07170 * SCL : Start of current text buffer address corresponding
                   07180 * to top left corner of video screen.
                   07190 * MARGIN : End of current text buffer address corresponding
                   07200 * to bottom right corner of video screen.
130D 8E   0400     07210 EDIT    LDX #$400 First, the cursor pointer at top left corner.
1310 9F   0A       07220         STX <CLW
1312 DC   02       07230 EDIT1   LDD <BUFST
1314 DD   06       07240 NEWPGE  STD <SCL
1316 C3   01FF     07250         ADDD #$1FF
1319 1093 04       07260         CMPD <BUFEN
131C 25   05       07270         BLO SKIP
131E DC   04       07280         LDD <BUFEN
1320 83   0001     07290         SUBD #1
1323 DD   08       07300 SKIP    STD <MARGIN
1325 17   00B3     07310         LBSR COPY
1328 109E 0A       07320         LDY <CLW
                   07330 * This routine waits for user to press a key. Y reg. points
                   07340 * to the screen address of cursor location. The character
                   07350 * and a black cursor ($80) are flashed alternately until
                   07360 * a key is pressed.
132B E6   A4       07370 EDWAIT  LDB ,Y
132D 34   04       07380         PSHS B Save character on stack.
132F 8E   0400     07390         LDX #$400
1332 BD   A7D3     07400         JSR DELAY
1335 BD   A1C1     07410         JSR INKYS
1338 C6   80       07420         LDB #$80 Get a black cursor.
133A E7   A4       07430         STB ,Y Place it at cursor pointer.
133C 8E   0400     07440         LDX #$400
133F BD   A7D3     07450         JSR DELAY
1342 35   04       07460         PULS B Get the character from stack.
1344 E7   A4       07470         STB ,Y Place it again at cursor pointer.
1346 81   00       07480         CMPA #0
1348 27   E1       07490         BEQ EDWAIT
134A 81   03       07500         CMPA #3 BREAK?
134C 26   06       07510         BNE SKIP0
                   07520 * Always revise the text buffer to match screen before
                   07530 * exiting routine.
134E 17   00A8     07540         LBSR REVISE
1351 16   FBA4     07550         LBRA FIN1
                   07560 * Check if any of the arrow keys is pressed.
                   07570 * Revise cursor pointer if arrow key pressed.
                   07580 * If cursor pointer goes beyond screen display area,
                   07590 * go to next page or previous page.
1354 81   0A       07600 SKIP0   CMPA #$0A
1356 26   0D       07610         BNE SKIP1
1358 31   A8 20    07620         LEAY 32,Y
135B 108C 05FF     07630 EDCHK   CMPY #$5FF
135F 1022 00A7     07640         LBHI NXTPGE
1363 20   C6       07650         BRA EDWAIT
1365 81   09       07660 SKIP1   CMPA #$09
1367 26   04       07670         BNE SKIP2
1369 31   21       07680         LEAY 1,Y
136B 20   EE       07690         BRA EDCHK
136D 81   5E       07700 SKIP2   CMPA #$5E
136F 26   0D       07710         BNE SKIP3
1371 31   A8 E0    07720         LEAY -32,Y
1374 108C 0400     07730 EDCK    CMPY #$400
1378 1025 00A6     07740         LBLO PRVPGE
137C 20   AD       07750         BRA EDWAIT
137E 81   08       07760 SKIP3   CMPA #$08
1380 26   04       07770         BNE SKIP4
1382 31   3F       07780         LEAY -1,Y
1384 20   EE       07790         BRA EDCK
                   07800 * CLEAR key will branch to DELETE routine and SHIFT CLEAR
                   07810 * key will branch to INSERT routine.
1386 81   0C       07820 SKIP4   CMPA #$0C
1388 1027 00AE     07830         LBEQ DELETE
138C 81   5C       07840         CMPA #$5C
138E 1027 00F8     07850         LBEQ INSERT
                   07851 * Place the edited character at cursor pointer.
1392 8D   0A       07860         BSR CHANGE
1394 A7   A0       07870         STA ,Y+
1396 108C 05FF     07880         CMPY #$5FF
139A 22   6E       07890         BHI NXTPGE
139C 20   8D       07900         BRA EDWAIT
                   07910 * This routine changes the ASCII of character for
                   07920 * screen printing.
139E 81   00       07930 CHANGE  CMPA #$0
13A0 26   02       07940         BNE SK5
13A2 86   FF       07950         LDA #$FF
13A4 81   0D       07960 SK5     CMPA #$0D
13A6 26   02       07970         BNE SKIP5
13A8 86   BF       07980         LDA #$BF
13AA 81   60       07990 SKIP5   CMPA #$60
13AC 25   08       08000         BLO SKIP6
13AE 81   80       08010         CMPA #$80
13B0 24   04       08020         BHS SKIP6
13B2 80   60       08030         SUBA #$60
13B4 20   06       08040         BRA CHNGOK
13B6 81   40       08050 SKIP6   CMPA #$40
13B8 24   02       08060         BHS CHNGOK
```

```
13BA 8B   40       08070         ADDA #$40
13BC 39            08080 CHNGOK  RTS
                   08090 * This routine converts back the screen byte into ASCII
                   08100 * character for placing it in the text buffer.
13BD 81   FF       08110 UNCHNG  CMPA #$FF
13BF 26   03       08120         BNE NONULL
13C1 4F            08130         CLRA
13C2 20   16       08140         BRA UNOK
13C4 81   BF       08150 NONULL  CMPA #$BF
13C6 26   04       08160         BNE SKIP7
13C8 86   0D       08170         LDA #$0D
13CA 20   0E       08180         BRA UNOK
13CC 81   40       08190 SKIP7   CMPA #$40
13CE 24   04       08200         BHS SKIP8
13D0 8B   60       08210         ADDA #$60
13D2 20   06       08220         BRA UNOK
13D4 81   60       08230 SKIP8   CMPA #$60
13D6 25   02       08240         BLO UNOK
13D8 80   40       08250         SUBA #$40
13DA 39            08260 UNOK    RTS
                   08270 * This routine brings a copy of portion of the text
                   08280 * buffer area to the video screen.
13DB BD   A928     08290 COPY    JSR CLS
13DE 108E 0400     08300         LDY #$400
13E2 9E   06       08310         LDX <SCL
13E4 A6   80       08320 COP1    LDA ,X+
13E6 8D   B6       08330         BSR CHANGE
13E8 A7   A0       08340 COP2        STA ,Y+
13EA 9C   08       08350         CMPX <MARGIN
13EC 23   F6       08360         BLS COP1
13EE 108C 0600     08370         CMPY #$600
13F2 27   04       08380         BEQ COPOUT
13F4 86   FF       08390         LDA #$FF
13F6 20   F0       08400         BRA COP2
13F8 39            08410 COPOUT          RTS
                   08420 * This subroutine takes the edited text from the screen
                   08430 * area and places it back at the proper location in the
                   08440 * text buffer area.
13F9 108E 0400     08450 REVISE  LDY #$400
13FD 9E   06       08460         LDX <SCL
13FF A6   A0       08470 REV1    LDA ,Y+
1401 8D   BA       08480         BSR UNCHNG
1403 A7   80       08490         STA ,X+
1405 9C   08       08500         CMPX <MARGIN
1407 23   F6       08510         BLS REV1
1409 39            08520         RTS
                   08530 * If Y > $5FF cursor goes to top of next page in this
                   08540 * routine. The text buffer is always revised to match
                   08550 * screen buffer before going to next page.
140A 31   A9 FE00  08560 NXTPGE  LEAY -512,Y
140E 109F 0A       08570         STY <CLW
1411 8D   E6       08580         BSR REVISE
1413 DC   08       08590         LDD <MARGIN
1415 C3   0001     08600         ADDD #1
1418 1093 04       08610         CMPD <BUFEN
141B 1027 FEF3     08620         LBEQ EDIT1
141F 16   FEF2     08630         LBRA NEWPGE
                   08640 * If Y < $400 the cursor goes to bottom of previous page.
                   08650 * The text buffer is always revised to match screen buffer
                   08660 * before going to previous page.
1422 31   A9 0200  08670 PRVPGE  LEAY $200,Y
1426 109F 0A       08680         STY <CLW
1429 8D   CE       08690         BSR REVISE
142B DC   06       08700         LDD <SCL
142D 83   0200     08710         SUBD #$200
1430 1093 02       08720         CMPD <BUFST
1433 1025 FEDB     08730         LBLO EDIT1
1437 16   FEDA     08740         LBRA NEWPGE
                   08750 * Delete a character routine.
                   08760 * One character at a time is deleted and the text on
                   08770 * screen is moved one to the left upto the bottom right
                   08780 * corner of screen. The next character from the text buffer
                   08790 * area is brought to screen. All the characters in the
                   08800 * text buffer are also moved one address down.
143A 1F   21       08810 DELETE  TFR Y,X Get cursor pointer in X reg.
143C 30   01       08820         LEAX 1,X        X=X+1
143E 8C   0600     08830         CMPX #$600 Is it beyond screen buffer?
1441 27   26       08840         BEQ DEL2 Go to DEL" if yes.
1443 A6   84       08850         LDA ,X Get the character.
1445 A7   82       08860         STA ,-X Place it to the left.
1447 81   FF       08870         CMPA #$FF End of the text?
1449 26   11       08880         BNE DEL1 Goto DEL1 if not.
                   08881 * End of text means time to revise text buffer.
144B 9E   08       08890         LDX <MARGIN
144D 9F   04       08900         STX <BUFEN
144F 30   1F       08910         LEAX -1,X
1451 9F   08       08920         STX <MARGIN
1453 34   20       08930         PSHS Y Save Video screen cursor pointer.
1455 8D   A2       08940         BSR REVISE
1457 35   20       08950         PULS Y Get back the cursor pointer.
1459 16   FECF     08960         LBRA EDWAIT
                   08961 * Keep on shifting characters to the left until end of
                   08962 * video screen buffer.
145C 30   02       08970 DEL1    LEAX 2,X
145E 8C   0600     08980         CMPX #$600
1461 27   06       08990         BEQ DEL2
1463 A6   84       09000         LDA ,X
```

```
1465 A7   82      09010          STA ,-X
1467 20   F3      09020          BRA DEL1
                  09021 * Time to place first character from next text buffer
                  09022 * area into bottom right corner of video screen buffer.
1469 9E   08      09030 DEL2     LDX <MARGIN
146B 30   01      09040          LEAX 1,X
146D A6   84      09050          LDA ,X
146F 27   12      09060          BEQ DEL4 Goto DEL4 if end of text.
1471 17   FF2A    09070          LBSR CHANGE
1474 B7   05FF    09080          STA $5FF
1477 30   1F      09090          LEAX -1,X
                  09091 * Move all the text buffer characters one address down.
1479 30   02      09100 DEL3     LEAX 2,X
147B A6   84      09110          LDA ,X
147D 27   04      09120          BEQ DEL4
147F A7   82      09130          STA ,-X
1481 20   F6      09140          BRA DEL3
                  09141 * shift last character one address down.
1483 A7   82      09150 DEL4     STA ,-X
1485 9F   04      09160          STX <BUFEN
1487 16   FEA1    09170          LBRA EDWAIT
                  09180 * Inserting characters, one at a time in the middle.
                  09190 * All the text after cursor location is moved one to the
                  09200 * right to make room for new user input. The text in the
                  09210 * text buffer area after the character at bottom right of
                  09220 * screen is also moved up one address at the same time.
148A 1F   21      09230 INSERT  TFR Y,X Get cursor pointer in X reg.
                  09231 * Wait for insert.
148C BD   A1C1    09240 INWAIT  JSR INKYS
148F 27   FB      09250          BEQ INWAIT
1491 81   03      09260          CMPA #$3 BREAK?
1493 1027 FE94    09270          LBEQ EDWAIT Exit insert mode.
1497 17   FF04    09280          LBSR CHANGE
149A 34   02      09290          PSHS A Save character to be inserted.
149C A6   80      09300          LDA ,X+ Get character at cursor pointer : X=X+1
149E 8C   0600    09310          CMPX #$600 Out of screen buffer?
14A1 27   2A      09320          BEQ INS2 Go to INS2 if yes.
14A3 E6   84      09330 INS0     LDB ,X Get next character in B reg.
14A5 A7   80      09340          STA ,X+ Place previous character to the right.
14A7 8C   0600    09350          CMPX #$600
14AA 27   1F      09360          BEQ INS1
14AC 1E   89      09370          EXG A,B Switch character from B to A
14AE 81   FF      09380          CMPA #$FF End of text?
14B0 26   F1      09390          BNE INS0 Keep on moving characters to the right.
14B2 8C   05FF    09400          CMPX #$5FF End of screen buffer?
14B5 27   EC      09410          BEQ INS0
                  09411 * When text buffer is smaller than screen buffer following
                  09412 * routine is required.
14B7 34   10      09420          PSHS X Save cursor pointer.
14B9 9E   04      09430          LDX <BUFEN X=text buffer end pointer.
14BB 9F   08      09440          STX <MARGIN Store it to correspond bottom of screen buffer.
14BD 30   01      09450          LEAX 1,X X=X+1
14BF 9F   04      09460          STX <BUFEN Increase BUFEN
14C1 35   10      09470          PULS X Get cursor pointer again.
14C3 A7   84      09480          STA ,X Store character at cursor pointer.
14C5 35   02      09490          PULS A Get character to be inserted.
14C7 A7   A0      09500          STA ,Y+ Place it at cursor pointer. : Y=Y+1
14C9 20   BF      09510          BRA INSERT Branch to insert.
                  09511 * Here when text buffer needs to be moved up one address.
14CB 1E   89      09520 INS1     EXG A,B Switch characters from B to A.
                  09521 * Character from Bottom right corner of video screen
14CD 17   FEED    09530 INS2     LBSR UNCHNG
14D0 9E   08      09540          LDX <MARGIN
14D2 30   01      09550          LEAX 1,X
                  09551 * This section moves the remaining text buffer one address up.
14D4 E6   84      09560 INS3     LDB ,X
14D6 A7   80      09570          STA ,X+
14D8 1E   89      09580          EXG A,B
14DA 81   00      09590          CMPA #0
14DC 26   F6      09600          BNE INS3
14DE A7   84      09610          STA ,X
14E0 9F   04      09620          STX <BUFEN
14E2 35   02      09630          PULS A Get the charater to be inserted.
14E4 A7   A0      09640          STA ,Y+ Place it at cursor pointer. : Y=Y+1
14E6 108C 05FF    09650          CMPY #$5FF Within screen buffer?
14EA 23   9E      09660          BLS INSERT Go insert more characters.
                  09661 * Make sure to revise text buffer corresponding to the
                  09662 * screen buffer
14EC 17   FF0A    09670          LBSR REVISE
                  09671 * Insert to continue at top of video screen as new page.
14EF DC   08      09680          LDD <MARGIN
14F1 C3   0001    09690          ADDD #1
14F4 DD   06      09700          STD <SCL
14F6 C3   01FF    09710          ADDD #$1FF
14F9 1093 04      09720          CMPD <BUFEN
14FC 25   05      09730          BLO INS4
14FE DC   04      09740          LDD <BUFEN
1500 83   0001    09750          SUBD #1
                  09751 * Insert continues here when next text buffer is smaller
                  09752 * than video screen buffer.
1503 DD   08      09760 INS4     STD <MARGIN
1505 17   FED3    09770          LBSR COPY
1508 108E 0400    09780          LDY #$400
150C 16   FF7B    09790          LBRA INSERT
```

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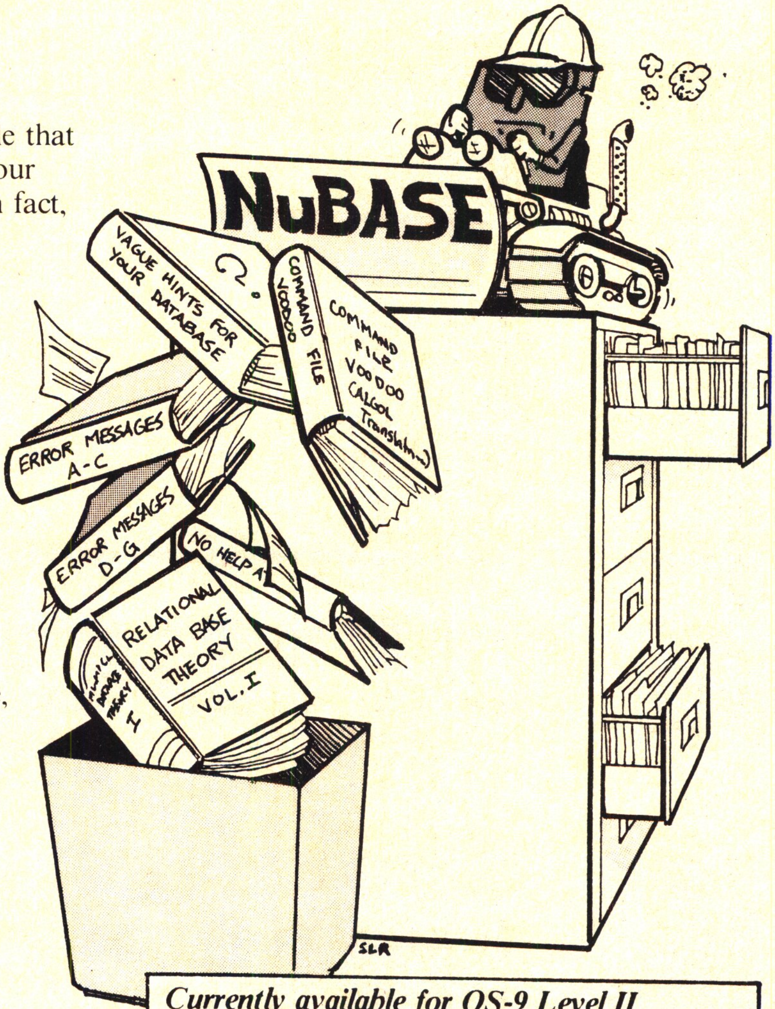
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```
150F    0000    09800 NONAME  FDB 0
1511    3C      09810 ERRMSG  FCC "<Break> TO EXIT. ERROR #"
1529    0000    09820         FDB $0
152B    20      09830 MES     FCC "    LOAD/SAVE ROUTINE"
1541    0D      09840         FCB $0D
1542    20      09850         FCC "    PRESS break TO EXIT"
155A    0D0D    09860         FDB $0D0D
155C    20      09870         FCC " enter FILE NAME: "
156E    00      09880         FCB $0
156F    0D      09890 ERMES   FCB $0D
1570    42      09900         FCC "BUFFER EMPTY"
157C    00      09910         FCB $00
157D    20      09920 MES1    FCC *   A SIMPLE TEXT PROCESSOR*
1598    0D      09930         FCB $0D
1599    20      09940         FCC *     BY A.K. BASARGEKAR*
15B1    0D0D    09950         FDB $0D0D
15B3    20      09960      FCC * TEXT IN < > WILL BE UNDERLINED*
15D2    0D      09970         FCB $0D
15D3    20      09980         FCC * SELECT 1-8. HIT break FOR MENU*
15F2    0D0D    09990         FDB $0D0D
15F4    20      10000         FCC * 1 - COMPOSE*
1600    0D      10010         FCB $0D
1601    20      10020         FCC * 2 - EDIT*
160A    0D      10030         FCB $0D
160B    20      10040         FCC " 3 - CLOAD"
1615    0D      10050         FCB $0D
1616    20      10060         FCC " 4 - DLOAD"
1620    0D      10070         FCB $0D
1621    20      10080         FCC * 5 - PRINT*
162B    0D      10090         FCB $0D
162C    20      10100         FCC * 6 - CSAVE*
1636    0D      10110         FCB $0D
1637    20      10120         FCC " 7 - DSAVE"
1641    0D      10130         FCB $0D
1642    20      10140         FCC * 8 - EXIT*
164B    00      10150         FCB $0
164C    20      10160 MES4    FCC " TOTAL LINE WIDTH = "
1660    000D    10170         FDB $000D
1662    0D      10180         FCB $0D
1663    20      10190         FCC " LEFT MARGIN = "
1672    000D    10200         FDB $000D
1674    0D      10210         FCB $0D
1675    20      10220         FCC " LINE SPACING = "
1685    000D    10230         FDB $000D
1687    0D      10240         FCB $0D
1688    20      10250         FCC " TURN ON PRINTER AND enter"
16A2    0D0D    10260         FDB $0D0D
16A4    20      10270         FCC " OR PRESS break TO EXIT"
16BB    00      10280         FCB 0
16BC    00      10290         FCB 0
16BD    52      10300 MES5    FCC "READY CASSETTE?"
16CC    0D00    10310         FDB $0D00
16CE            10320 BUFF    RMB 0
        0E00    10330         END START
```

One-Liner Contest Winner . . .

Did you ever hear the old question about whether a penny doubled each day for a month is more than a million dollars? This program gives you the true scoop on your printer.

The listing:

```
10 POKE150,42:PRINT#-2,"KING OF
THE ONE-LINERS, PENNY DBLR";CHR$
(13);"SEND PRIZE TO Lee Veal, 88
09 Linda Vista, Rowlett, TX 7508
8":A=.01:PRINT#-2:PRINT#-2,TAB(1
0)"AMOUNT";" DAY":FOR X=1TO31:PR
INT#-2,USING"$$###,###,###.##";A
;:PRINT#-2," ";X:A=A+A:NEXT
```

Lee Veal
Rowlett, TX

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Adventure* and its companion *Rainbow Adventure Tape.*)

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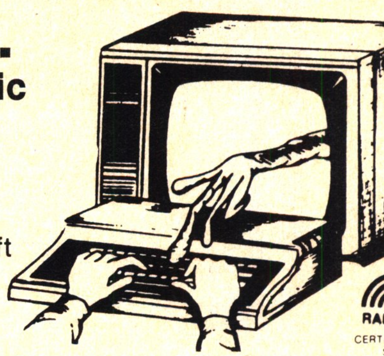

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RAINBOW REVIEW
JULY 1984

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This is the final part in a series on diskette file organization

The Diskette Directories Handler System

By Marvin E. Swan

The complete "Diskette Directories Handler" system is being presented in three parts. You must *RUN* program *DIR1* before *RUNning* this month's program *DIR3*.

You can refer to RAINBOW two months ago for Part 1 and a full overview of all seven comprehensive reports generated by the *Handler* system and an explanation of program *DIR1*. You can refer to last month's RAINBOW for an explanation of program *DIR2*. To refresh your memory, here is the cross reference of all programs and reports and their *RUN* sequence:

Program Name	Optional Report	Report Title	Sequenced By:
DIR0	no	DOCUMENTATION	
DIR1	yes	#1 EXTR. & LOAD DIR	your own diskette filing
DIR1	yes	#2 DISKETTE NAMES	diskette name
DIR1	yes	#3 DISKETTE USAGE	number of bytes used
DIR1	yes	#4 DISK JACKET LABELS	your own diskette filing
DIR2	yes	#5 DISK LABELS (gum)	your own diskette filing
DIR3	no	#6 CONSOLIDATION	prog/size/diskette name
DIR3	no	#7 SUMMARY (stats)	

Consolidated Directories, Report #6

This month, report #6 is generated by program *DIR3*. The purpose of report #6 is to show all programs and data files cataloged to your PC system, sequenced by name, extension, format, type, granule size, byte size and diskette name. You can look up a particular program/data filename and see where it resides and how many multiple versions you may have saved to more than one diskette. An asterisk appears under the "FLAG" column when you have different byte-sized BASIC or machine language programs of the same name, allowing you to determine the correct version to *RUN* or *EXECUTE*. This report is the nucleus of the *Handler* system, which you will reference more often than others. You can cross reference all programs/data files in your PC system giving you the ability to purge and manage your entire diskette library.

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Disks Directory Summary, Report #7

This report is generated by program *DIR3*. The purpose of report #7 is to show statistical and percentage totals of all your diskettes, granules, bytes, programs and data files in your system. The following statistics and percentages will print:

- Total diskettes
- Bytes/granules used, not used, final total
  (Note that percentage between granules and bytes do not match because granules are in increments of 2,304 bytes each and bytes are absolute.)
- Total BASIC, assembly and machine language programs
- Total data files
- Total multiple program versions with different byte size
- Total diskettes with disk read errors encountered
- Total reports you requested from *Handler* system.

The purpose of *DIR3* is to print the *Consolidated Directories* report #6 and the statistical *Disks Directory Summary* report #7. *DIR3* is automatically *RUN* by program *DIR2* if you previously selected optional report #5, otherwise it is automatically *RUN* by program *DIR1*. The entire catalog file is sorted in RAM for the consolidation report. The sort is unique because it passes the catalog file six times, allowing for faster sorting on smaller amounts of data giving the advantage of being able to sort up to 2,100 records from disk. I strongly urge you to replace the BASIC bubble sort with a machine language sort. I purchased one advertised through RAINBOW that literally sorts in seconds. When *DIR2* is complete, be sure to back up the catalog file to an archival diskette. The following BASIC line numbers contain Epson brand printer codes that you may change to satisfy your printer brand requirements and a high speed poke for the bubble sort: 0490, 0740 and 0820.

Program *DIR0*

The purpose of *DIR0* is to give you a quick blurb on how programs *DIR1*, *DIR2* and *DIR3* integrate. It gives you a record layout of the catalog file, BASIC line numbers within all programs for high speed pokes and Epson print codes and a host of other useful information. You do not have to *RUN* this program to process the *Handler* system. *DIR0* simply prints a quick and dirty explanation of the *Handler* system when you can't find your RAINBOW for reference.

The Final Saga

I sincerely hope you enjoy using the *Handler* system. My friends and I have been using it successfully for about 18 months. I am putting together a subsystem to the *Handler* system which allows you to add and delete directory information to the catalog file without having to reprocess all your diskettes again when you want to regenerate the seven reports. I am hoping RAINBOW will share it with you in the near future.

3-D Filing Cabinet With 'Windows'

If you have not been keying in th four programs, you may *CLOADM* them off the RAINBOW ON TAPE or mail a formatted diskette with $8.50 to Marv's Computer Room, 17323 40th Avenue South, Seattle, WA 98188, and I will mail them to you. In addition to the "complete" *Handler* system, I will include a program that displays up to 15 graphic *PMODE4* windows, showing a filing cabinet with drawers that open and shut, and printer paper images with text coming out of the drawers and hanging in front of the cabinet. The *Diskette Directories Handler* system can be *RUN* from one of the four drawers. The other three drawers will surprise you. Windows are commonly used on the more expensive business micros.

All programs and documentation are copyright 1984 by Marv Swan.

140	9
260	28
440	208
610	179
750	120
END	204

Listing 1:

```
10 '[DIR3]
20 'PROGRAM 3 OF 3
30 'COPYRIGHT 1984 BY MARV SWAN
40 '
50 CLS:PRINT
60 VERIFYON:GOTO930
70 CLEAR19500
80 DD$="disks directory":L=66:T$
="FILE "
90 FT$(0)="Program Basic":FT$(1)
="Data File":FT$(2)="Program Mac
h L":FT$(3)="Program Assy L":DIM
D$(450):G$(1)="' ' TO 'B'":G$(2)
="'C' TO 'E'":G$(3)="'F' TO 'L'"
:G$(4)="'M' TO 'Q'":G$(5)="'R' T
O 'S'":G$(6)="'T' TO 'Z'":G=1
100 GOSUB690:SOUND10,3:PRINT"mak
e sure THAT THE DISK WORK    FIL
E CREATED BY PROGRAM DIR1    IS
IN DRIVE 0":PRINT@224,"type FILE
 NAME OF 1-8 CHARACTERSWITHOUT E
XTENSION":PRINT"  ........"
110 PRINT@288,"";:INPUTDI$
120 IFLEN(DI$)<1 OR LEN(DI$)>8 G
OTO100
130 I=INSTR(DI$,"/"):IFI<>0 GOTO
100
140 I=INSTR(DI$,"."):IFI<>0 GOTO
100
150 FORX=3TO11
160 DSKI$0,17,X,A$,B$:F=INSTR(B$
,DI$):IFF>0THENFT=FT+1
170 F=INSTR(A$,DI$):IFF>0THENFT=
FT+1
180 NEXT
190 IFFT=0THENSOUND10,3:GOSUB690
:PRINT@128,"'";DI$;"' NOT FOUND
ON DISKETTE":PRINT"press ENTER T
O retype FILE NAME":GOSUB700:GOT
O100 ELSEDI$=DI$+".DIR"
200 OPEN"I",#1,DI$:INPUT#1,DA$
210 GOSUB680:PRINT" reading inpu
t directory file ";:PRINT@129,T$
```

```
"NAME:";:PRINT@140,DI$;
220 PRINT@161,T$"DATE:";:PRINT@1
72,DA$;:PRINT@193,T$"PASS:";:I$=
STR$(G):I$=RIGHT$(I$,1):PRINT@20
4,I$" OF 6";:PRINT@225,"REC # IN
:";:PRINT@236,"0";:PRINT@257,"DA
TA IN:";:PRINT@268,"NONE";:PRINT
@289,"SEARCHING:";:PRINT@300,"PR
EFIX "G$(G);
230 PRINT@352," records selected
 for sort ";:PRINT@385,"REC # OU
T:";:PRINT@396,"0";:PRINT@417,"D
ATA OUT:";:PRINT@428,"NONE";
240 P=P+1
250 INPUT#1,R$:TT=TT+1:I$=STR$(T
T-1):I$=RIGHT$(I$,LEN(I$)-1):PRI
NT@236,I$S$;
260 IFR$="T0TALS"THENSOUND10,3:D
$(P)=R$:S$=STR$(TT-1):S$=" OF "+
RIGHT$(S$,LEN(S$)-1):IFP<>1GOTO4
30ELSE720
270 PRINT@268,LEFT$(R$,8)" "MID$
(R$,9,3);
280 A$=LEFT$(R$,1)
290 IFG=1ANDA$<"C"GOTO410
300 IFG=1GOTO250
310 IFG=2ANDA$>"B"ANDA$<"F"GOTO4
10
320 IFG=2GOTO250
330 IFG=3ANDA$>"E"ANDA$<"M"GOTO4
10
340 IFG=3GOTO250
350 IFG=4ANDA$>"L"ANDA$<"R"GOTO4
10
360 IFG=4GOTO250
370 IFG=5ANDA$>"Q"ANDA$<"T"GOTO4
10
380 IFG=5GOTO250
390 IFA$>"S"GOTO410
400 GOTO250
410 D$(P)=LEFT$(R$,41)
420 I$=STR$(P):I$=RIGHT$(I$,LEN(
I$)-1):PRINT@396,I$;:PRINT@428,L
EFT$(R$,8)" "MID$(R$,9,3);:GOTO2
40
430 SOUND10,3:GOSUB820:GOSUB680:
I$=STR$(G):PRINT" PRINTING REPOR
T #6, PASS "RIGHT$(I$,1)"..."
440 IFG=1 THEN PT=INT((TT/57)+.9
99999999):PK=0
450 JK=0
460 IFL>60GOSUB650 ELSEGOTO530
470 PK=PK+1:IFPK<10THENTB=46ELSE
TB=45
480 IFPT>9THENTB=TB-1
490 PRINT#-2,TAB(5)DA$;TAB(16)CH
```

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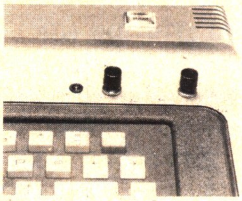

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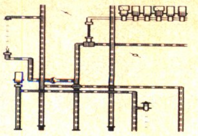
```
R$(14);"consolidated directories
";CHR$(20);TAB(TB)"page";PK;"of"
;PT
500 PRINT#-2:PRINT#-2,TAB(5)"nam
e     ext  format  type";TAB(40)
"grans   bytes  diskette name";T
AB(75)"flag"
510 PRINT#-2,TAB(5)"====     ===
 ======  ====";TAB(40)"=====
=====  =============";TAB(75)"==
=="
520 L=L+4
530 JK=JK+1:R$=D$(JK)
540 IFMID$(R$,12,1)="+"THENPRINT
#-2,TAB(5)"++++++++ +++  Fatal D
isk Read Error   00       0  ";M
ID$(R$,22,20):GOTO610
550 IF MID$(R$,12,1)="B" THEN FR
MT$="Binary" ELSE FRMT$="Ascii"
560 TYPE=VAL(MID$(R$,13,1))
570 BYTES=VAL(MID$(R$,16,6))
580 IF HR$=LEFT$(R$,13) AND HBYT
E$<>MID$(R$,16,6) THEN ERR$="*":
ERR=ERR+1:GOTO600 ELSE ERR$=""
590 HR$=LEFT$(R$,13):HBYTE$=MID$
(R$,16,6)
600 PRINT#-2,TAB(5)LEFT$(R$,8);T
AB(14)MID$(R$,9,3);TAB(19)FRMT$;
TAB(27)FT$(TYPE);TAB(43)MID$(R$,
14,2);:PRINT#-2,TAB(46);:PRINT#-
2,USING"###,###";BYTES;:PRINT#-2
,TAB(55)RIGHT$(R$,20);:IF ERR$="
" THEN PRINT#-2 ELSE PRINT#-2,TA
B(78)ERR$
610 L=L+1
620 IFJK=P-1GOTO720
630 IFL>60GOTO460
640 GOTO530
650 IFL=66GOTO670
660 PRINT#-2:L=L+1:IFL<>66GOTO66
0
670 L=0:RETURN
680 SOUND10,3
690 CLS2:PRINT@1,"PRINT CONSOLID
ATED DIRECTORIES";:PRINT@41,"PRO
GRAM 3 OF 3";:PRINT@96,"";:RETUR
N
700 I$=INKEY$:IFI$=""GOTO700ELSE
RETURN
710 FORS=1TO500:NEXTS:RETURN
720 IFG<>6THENCLOSE#1:G=G+1:P=0:
TT=0:GOTO200
730 GOSUB690:PRINT" PRINTING REP
ORT #7..."
740 GOSUB650:PRINT#-2,DA$;TAB(15
);CHR$(14);"disks directory summ
ary";CHR$(20);TAB(47)"page 1 of
1"
750 INPUT#1,T$,T
760 IFT$="1"THENPRINT#-2:GOTO750
770 IFT$="END"THENCLOSE#1:PRINT@
416,"";:END
780 IFRIGHT$(T$,7)="flagged"THEN
T=ERR
790 J=40-LEN(T$):PRINT#-2,TAB(9)
:PRINT#-2,USING"#,###,###,###";T
;:PRINT#-2,STRING$(J,".");:PRINT
#-2,T$
800 IF(RIGHT$(T$,7)="flagged"AND
ERR>0)THENI=(ERR/TT)*100:I=I+.25
:I=INT(I):PRINT#-2,TAB(9):PRINT#
-2,USING"#,###,###,###";I;:PRINT
#-2,"............percentage ver
sions flagged"
810 GOTO750
820 POKE65495,0 '<===== note
830 GOSUB690
840 FORX=1TOP-1:P1=INT((X/P)*100
):PRINT@96,P1;"% SORTED"
850 FORY=X TOP-1:IFD$(Y)<D$(X)TH
ENS1$=D$(X):D$(X)=D$(Y):D$(Y)=S1
$
860 NEXTY:NEXT X
870 PRINT@96," 100 % SORTED"
880 PRINT@160,P-1"RECORDS SORTED
"
890 IFP-1>50THENPRINT@224," WHEW
!!"
900 FORX=1TO800:NEXT
910 POKE65494,0
920 RETURN
930 PMODE0:PCLEAR1:GOTO70
```

290	41
580	184
760	248
END	255

Listing 2:

```
10 '[DIR0]
20 '
30 'DOCUMENTATION FOR PROGRAMS
   DIR1, DIR2 AND DIR3
40 'RUN THIS PROGRAM AND A HARD
   COPY WILL PRINT EXPLAINING
   THE 3 PROGRAMS
50 '
60 '
70 '
80 VERIFYON:CLEAR500
90 DATA" D o c u m e n t a t i o
 n"
100 DATA" "
110 DATA"           f o r"
120 DATA" "
130 DATA"Diskette Directories Ha
ndler"
140 DATA"Programs DIR1, DIR2 and
```



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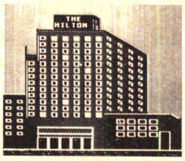

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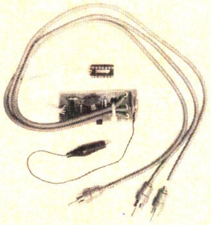

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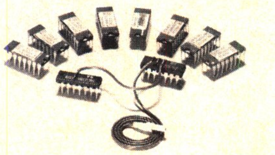
64K UPGRADES



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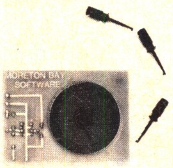
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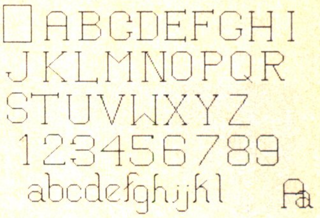
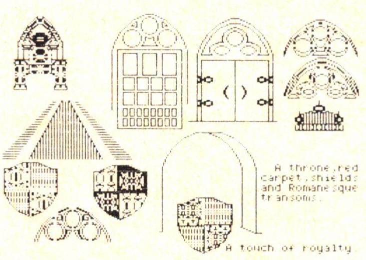
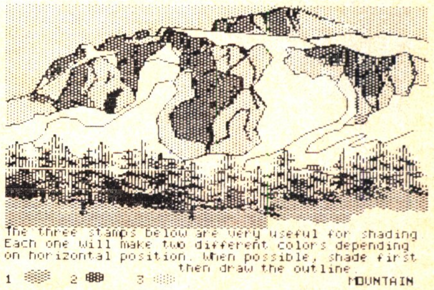

ABCDEFGHI
JKLMNOPQR
STUVWXYZ
123456789
abcdefghijkl


A throne, red carpet, shields and Romanesque transoms.
A touch of royalty

Adventure Disk I (indoor scenes and objects)

Adventure Disk II (outdoor scenes)


The three stamps below are very useful for shading Each one will make two different colors depending on horizontal position. When possible, shade first then draw the outline.
1
2
3
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*Zaxxon Reg TM Sega Corp.
**Color Computer Reg TM Tandy Corp.

```
 DIR3"
150 DATA"Copyright 1984 by Marv
Swan"
160 DATA" "
170 DATA" "
180 DATA"The Diskette DIrectorie
s Handler system consists of 3 p
rograms"
190 DATA"that generate all your
diskette directories information
 onto"
200 DATA"7 comprehensive reports
"
210 DATA" "
220 DATA" "
230 DATA"Minimum computer system
 requirements:"
240 DATA"  * 32K OF RAM"
250 DATA"  * EXTENDED DISK BASIC
260 DATA"  * 1 DISK DRIVE"
270 DATA"  * 1 TAPE DRIVE"
280 DATA"  * 1 PRINTER"
290 DATA" "
300 DATA"Program DIR1 explanatio
n:"
310 DATA"  * READ ALL DISKETTE D
IRECTORIES IN YOUR SYSTEM"
320 DATA"    AND EXTRACT INFORMA
TION ABOUT ALL YOUR PROGRAMS & F
ILES"
330 DATA"  * GENERATE TAPE WORK
FILE OF DIRECTORIES CONTAINED ON
 ALL DISKETTES"
340 DATA"  * PRINT (OPTIONAL) 'E
XTRACT & LOAD DIRECTORIES' REPOR
T #1"
350 DATA"  * STORE DISKETTE NAME
S & USAGE IN TABLE"
360 DATA"  * SORT DISKETTE NAMES
 TABLE"
370 DATA"  * PRINT (OPTIONAL) 'D
ISKETTE NAMES' REPORT #2"
380 DATA"  * SORT DISKETTE USAGE
 TABLE"
390 DATA"  * PRINT (OPTIONAL) 'D
ISKETTE USAGE' REPORT #3"
400 DATA"  * TRANSFER TAPE WORK
FILE TO DISK WORK FILE ON DRIVE
0"
410 DATA"  * READ DISK WORK FILE
 AND PRINT (OPTIONAL) DISKETTE J
ACKET"
420 DATA"    LABEL' DIRECTORY RE
PORT #4"
430 DATA"  * THIS PROGRAM PASSES
 THE DISK WORK FILE ON DRIVE 0 T
```

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```
0 PROG DIR2 AND/OR DIR3"
440 DATA"   * THIS PROGRAM LINKS
AND CALLS UP PROGRAM DIR2 OR DIR
3 ON DRIVE 0"
450 DATA" "
460 DATA"Program DIR2 explanatio
n:"
470 DATA"   * THIS PROGRAM IS RUN
 AFTER PROGRAM DIR1"
480 DATA"   * READ DISK WORK FILE
 GENERATED BY PROGRAM DIR1 FROM
DRIVE 0"
490 DATA"   * PRINT 'DISKETTE GUM
 LABELS' REPORT #5"
500 DATA"   * THIS PROGRAM LINKS
AND CALLS UP PROGRAM DIR3 ON DRI
VE 0"
510 DATA" "
520 DATA"Program DIR3 explanatio
n:"
530 DATA"   * THIS PROGRAM IS RUN
 AFTER DIR1 OR DIR2"
540 DATA"   * READ DISK WORK FILE
 GENERATED BY PROGRAM DIR1"
550 DATA"   * SORT DISK WORK FILE
, IN RAM, TO PROGRAMS & FILES SE
QUENCE"
560 DATA"   * PRINT 'CONSOLIDATED
 DIRECTORIES' REPORT #6"
570 DATA"   * PRINT 'DISKS DIRECT
ORY SUMMARY' REPORT #7"
580 DATA" "
590 DATA"record layout of tape w
ork file & disk work file:"
600 DATA"   * RECORD SIZE = 42 BY
TES"
610 DATA"   * 01-08 = 08 BYTE = N
AME OF PROGRAM OR DATA FILE"
620 DATA"   * 09-11 = 03 BYTE = E
XTENSION"
630 DATA"   * 12-12 = 01 BYTE = F
ILE FORMAT CODE"
640 DATA"                       *
 A = ASCII"
650 DATA"                       *
 B = BINARY"
660 DATA"   * 13-13 = 01 BYTE = F
ILE TYPE CODE"
670 DATA"                       *
 0 = BASIC PROGRAM"
680 DATA"                       *
 1 = DATA FILE"
690 DATA"                       *
 2 = MACHINE LANGUAGE PROGRAM"
700 DATA"                       *
 3 = ASSEMBLY LANGUAGE PROGRAM"
710 DATA"   * 14-15 = 02 BYTE = N
UMBER OF GRANULES"
720 DATA"   * 16-21 = 06 BYTE = N
UMBER OF BYTES"
730 DATA"   * 22-41 = 20 BYTE = N
AME OF DISKETTE"
740 DATA"   * 42-42 = 01 BYTE = S
PECIAL CODE USED BY PROGRAM DIR1
"
750 DATA"                       *
 'X' IDENTIFIES EVERY OTHER DISK
ETTE DURING DIR1 AND DIR2"
760 DATA" "
770 DATA"Printer brands:"
780 DATA"   * ALL PROGRAMS PRINT
ON ANY PRINTER, HOWEVER, REPORT"
790 DATA"     TITLES ARE DESIGNED
 & CODED TO PRINT ENLARGED LETTE
RS USING"
800 DATA"     EPSON CODES.  TO MO
DIFY FOR OTHER PRINTERS, LOOK AT
 LINES:"
810 DATA"       * DIR1: 0820 0830
 2680 3790"
820 DATA"       * DIR2: 0510 0960
 1020 1030 1040 1330"
830 DATA"       * DIR3: 0490 0740
840 DATA" "
850 DATA"High speed poke:"
860 DATA"   * THE FOLLOWING PROGR
AMS USE THE HIGH SPEED POKE FOR"
870 DATA"     FAST SORTING.  TO T
AKE OUT THE POKE, LOOK AT LINES:
"
880 DATA"       * DIR3: 0820"
890 DATA"END"
900 VERIFYON:CLS2:PRINT@1," DISK
ETTE DIRECTORIES HANDLER ";:PRIN
T@40," DOCUMENTATION ";
910 PRINT@129," ready THE PRINTE
R ";:PRINT@193," press ENTER WHE
N READY ";
920 I$=INKEY$:IFI$=""GOTO920
930 PRINT@289," PRINTING........
.. ";
940 PRINT@384,"";
950 READA$:IFA$<>"END"THENPRINT#
-2,A$:GOTO950
960 END
```

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GAMEMASTER'S APPRENTICE 16K

Designing Your Own Adventure

By George Firedrake and Art Canfil
Rainbow Contributing Editors

If you have never played a role playing game and want to begin playing, try a play-by-mail (PBM) game. Flying Buffalo Inc. created the play-by-mail industry. Anyone can learn to play these games. No previous gaming experience is required.

Begin by getting the rules for the game you play from Flying Buffalo Inc., Dept. GMA, P.O. Box 1467, Scottsdale, AZ 85252-1467. Below are names of PBM games and the prices for the rules.

— STARWEB	$2.00
— HEROIC FANTASY	1.00
— BATTLE PLAN	0.50
— NUCLEAR DESTRUCTION	0.25
— GALACTIC CONFLICT	1.00
— STARLORD	1.00
— BOARD OF DIRECTORS	0.25
— FEUDAL LORDS	1.00

Last time we suggested you sign up for *HEROIC FANTASY* and make a move every two weeks or once a month. First get the rules, then design a party of Adventurers and send them in as described in the rules, of course.

Your characters can be human or otherwise. Each character is a fighter or magic-user, but not both. The strength (STR) of a character is used to attack other characters or monsters, to defend oneself and others, cast magic spells, and numerous other things. The constitution (CON) of a character determines the amount of damage a character can withstand and continue living. Each character type has a price (COST). Here are all possible character types.

CODE	KINDRED	CLASS	STR	CON	COST
F	Fairy	Fighter	1	1	1
F	Fairy	Magic-user	1	1	2
G	Gremlin	Fighter	3	4	3
L	Leprechaun	Magic-user	3	4	4
H	Hobbit	Fighter	5	15	5
H	Hobbit	Magic-user	4	15	7
K	Goblin	Fighter	7	20	6
P	Human	Fighter	15	30	9
P	Human	Magic-user	10	30	11
E	Elf	Fighter	25	25	15
E	Elf	Magic-user	20	25	18
D	Dwarf	Fighter	30	40	23
D	Dwarf	Magic-user	30	40	36
O	Ogre	Fighter	35	40	29
O	Ogre	Magic-user	35	40	46
T	Troll	Fighter	50	50	57
X	Giant	Fighter	60	60	72

For any character, you may choose the name and whether the character is male or female.

You assemble a party of Adventurers by "buying" up to 15 characters. You have 100 points to spend in acquiring characters.

You have 100 points to spend.

(George Firedrake, a.k.a. Bob Albrecht, is one of the most prolific authors in the microcomputer world today. A specialist in writing for beginners, he is author of numerous books including TRS-80 Color BASIC. *Art Canfil enjoys designing games and writing. He is co-author of* Taipan: A Game In Context.)

Let's try it. For our first group, how about a big guy and 14 tiny helpers? Our group consists of a giant and 14 fairy magic-users.

QTY	KINDRED	CLASS	STR	CON	POINTS
1	Giant	Fighter	60	60	72
14	Fairy	Magic-user	14	14	28
		TOTALS	74	74	100

Or, instead of 14 fairies, let's try seven leprechauns.

QTY	KINDRED	CLASS	STR	CON	POINTS
1	Giant	Fighter	60	60	72
7	Leprechaun	Magic-user	21	28	28
		TOTALS	81	88	100

The second bunch is higher in both STR and CON than the first group.

When Frodo, et al. set forth to return the ring to Orodruin, his group included hobbits, humans, elves, and dwarves (plus Gollum, of course). Let's put together our own *Fellowship of the Ring.*

QTY	KINDRED	CLASS	STR	CON	POINTS
2	Hobbit	Fighter	10	30	10
2	Hobbit	Magic-user	8	30	14
1	Human	Fighter	15	30	9
1	Human	Magic-user	10	30	11
1	Dwarf	Fighter	30	40	23
1	Elf	Fighter	25	25	15
1	Elf	Magic-user	20	25	18
			118	210	100

This Adventuring party has much more total CON and STR than either previous group. Of course, we really don't know what is important until we send one of our groups into the labyrinth and find out what happens.

YOUR TURN. Design your own bunch of Adventurers. Remember, you have 100 points to spend and you can select, at the most, 15 Adventurers. Choose a name for each character and decide who is male and who is female.

CoCo Can Help Design A Group

The ratios of STR to COST and CON to COST might be useful indexes to help design a group of Adventurers. Here are some examples.

Fairy fighter:	STR/POINTS=1	CON/POINTS=1
Fairy magic-user:	STR/POINTS=.5	CON/POINTS=1
Goblin fighter:	STR/POINTS=1.17	CON/POINTS=3.67

Goblins are durable, compared to their cost, while fairies are fragile, relative to their cost. You can buy a lot of CON for your money by stocking up on goblins!

We have in mind several programs to help design Adventuring teams and play *HEROIC FANTASY.* First, we need a database of information about character types. Here it is:

```
32000 REM**HEROIC FANTASY GMA 21
32002 REM**CHARACTER TYPES
32004 REM**CODE$,KIN$,CLASS$,STR
,CON,PTS
32010 DATA F,FAIRY,F,1,1,1
32020 DATA F,FAIRY,M,1,1,2
32030 DATA G,GREMLIN,F,3,4,3
32040 DATA L,LEPRECHAUN,M,3,4,4
32050 DATA H,HOBBIT,F,5,15,5
32060 DATA H,HOBBIT,M,4,15,7
32070 DATA K,GOBLIN,F,7,20,6
32080 DATA P,HUMAN,F,15,30,9
32090 DATA P,HUMAN,M,10,30,11
32100 DATA E,ELF,F,25,25,15
32110 DATA E,ELF,M,20,25,18
32120 DATA D,DWARF,F,30,40,23
32130 DATA D,DWARF,M,30,40,36
32140 DATA O,OGRE,F,35,40,29
32150 DATA O,OGRE,M,35,40,46
32160 DATA T,TROLL,F,50,50,57
32170 DATA X,GIANT,F,60,60,72
32180 DATA Z,ENDFILE,Z,0,0,0
```

This is a small data file consisting of 18 records. Each record contains information about one character type. For instance:

32010 DATA F, FAIRY, F, 1, 1, 1

CODE KINDRED CLASS STR CON POINTS

Line 32004 tells you the names of the variables that we will use to store information from a *DATA* statment.

32004 REM**CODE$, KIN$, CLASS$, STR, CON, PTS

32060 DATA H, HOBBIT, M, 4, 15, 7

The last record, called ENDFILE, with CODE$ = "Z", is not a character type. It is the End-of-File (EOF) record.

32180 DATA $\underbrace{\text{Z,ENDFILE, Z, 0, 0, 0}}$

End-of-File record

(No more records in the file.)

We have written two programs that use the data file of *HEROIC FANTASY* character types.

The *SCAN CHARACTER TYPES* program begins at Line 1000. It lets you scan the entire file. To run it, type *RUN* or *RUN 1000.* It begins like this.

```
F FAIRY        F  1  1  1
TO DO AGAIN, PRESS SPACE BAR
```

SPACE BAR is in reverse color.

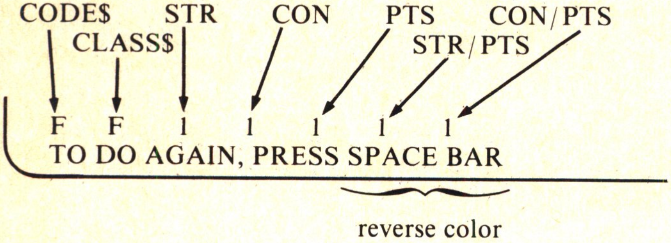
Press the space bar and you get the next record.

```
F FAIRY        F  1  1  1
F FAIRY        M  1  1  1
TO DO AGAIN, PRESS SPACE BAR
```

Keep pressing the space bar until you see 15 records on the screen. Press the space bar again to get the 16th record — the top record is "pushed off the top of the screen" and disappears.

Keep pressing the space bar until ENDFILE appears at the bottom of the screen. Press the space bar again and the CoCo starts over with the first record.

The *COMPUTE COST RATIOS* program begins at Line 2000. Type *RUN 2000* to run this program. First you see:



This program works the same way as the *SCAN CHARACTER TYPES* program. Each time you press the space bar, you see another line of information near the bottom of the screen. If you see ENDFILE and press the space bar, the CoCo starts over at the top of the data file.

Here are both programs and the subroutines they use.

The listing:

10000 195
END 147

```
1 REM**HEROIC FANTASY GMA 21-1
1000 REM**SCAN CHARACTER TYPES
1010 CLS
1020 RESTORE       'START AT TOP
1030 GOSUB 11010 'READ RECORD
1040 GOSUB 12010 'SHOW RECORD
1050 GOSUB 10010 'TELL HOW AGAIN
1099 '
1100 REM**START OVER IF ENDFILE
1110 IF KIN$="ENDFILE" THEN 1020
 ELSE 1030
1199 '
2000 REM**COMPUTE COST RATIOS
2010 CLS
2020 RESTORE       'START AT TOP
2030 GOSUB 11010 'READ RECORD
2040 GOSUB 13010 'COST RATIOS
2050 GOSUB 14010 'SHOW RATIOS
2060 GOSUB 10010 'TELL HOW AGAIN
2099 '
2100 REM**START OVER IF ENDFILE
2110 IF KIN$="ENDFILE" THEN 2020
 ELSE 2030
2199 '
10000 REM**DO AGAIN SUBROUTINE
10010 PRINT @480, "TO DO AGAIN,
PRESS space bar";
10020 IF INKEY$="" THEN 10020
ELSE RETURN
10099 '
11000 REM**READ RECORD SUBR.
11010 READ CODE$,KIN$,CLASS$,STR
,CON,PTS
11020 RETURN
11099 '
12000 REM**SHOW RECORD SUBR.
12010 PRINT @480, CODE$ TAB(2)
KIN$ TAB(16) CLASS$ TAB(19) STR
TAB(23) CON TAB(27) PTS
12020 RETURN
12099 '
13000 REM**COST RATIOS SUBR.
13010 IF KIN$="ENDFILE" THEN
SC=0: CC=0: RETURN
13020 SC = STR/PTS
13030 SC = INT(100*SC+.5)/100
13040 CC = CON/PTS
13050 CC = INT(100*CC+.5)/100
13060 RETURN
13099 '
```

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- Un-DISK will work even if you already own a disk but WHY BUY A DISK AT ALL?
- Un-DISK should be in the library of every serious CoCo user even if you own a disk says Frank J. Esser, independent reviewer for RAINBOW Magazine!

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```
14000 REM**SHOW COST RATIOS SUBR
14010 PRINT @480, CODE$ TAB(2)
CLASS$ TAB(5) STR TAB(9) CON
TAB(13) PTS TAB(17) SC TAB(24)CC
14020 RETURN
14099 '
```

Of course, remember to add the data file (lines 32000 through 32180) to the programs.

— To run *SCAN CHARACTER TYPES*, type *RUN* or *RUN 1000* and press ENTER.
— To run *COMPUTE COST RATIOS*, type *RUN 2000* and press ENTER.

These are "bare bones" programs. Try your hand at improving them. Also think about other programs to help you design an Adventuring team and guide them as they explore the labyrinth.

Who Is A Character?

A character is any imaginary person or other creature created according to the rules of a game system. The characters in *HEROIC FANTASY* are quite simple. The characters in *Dungeons & Dragons* or *RuneQuest* are much more detailed and complex. Characters in *Adventurer's Handbook* are simplified versions of characters found in the very elegant *RuneQuest* system.

We need a way of recording a character's characteristics, abilities, knowledge, possessions, and anything else we want to remember. Below is a blank character record. You may copy it for your own use.

Character Name ____________ Age ______ Sex ______ Race ____________
Background ______________________________

STR ______
CON ______
SIZ ______
INT ______ Idea ______
POW ______ Luck ______
DEX ______ Dodge ______
CHA ______ Persuade ______

HIT PTS. 0 1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

Armour ______________________________

POW PTS. 0 1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

SKILLS

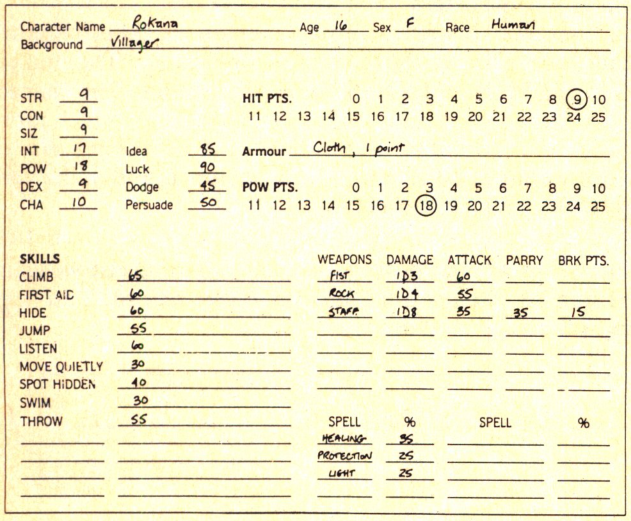
CLIMB	
FIRST AID	
HIDE	
JUMP	
LISTEN	
MOVE QUIETLY	
SPOT HIDDEN	
SWIM	
THROW	

WEAPONS	DAMAGE	ATTACK	PARRY	BRK PTS.

SPELL	%	SPELL	%

EQUIPMENT	MONEY

Last time we showed you the character record for Aloysious Anonymous, a very average character. Now meet Rokana.



Character Name Rokana Age 16 Sex F Race Human
Background Villager

STR	9			
CON	9			
SIZ	9			
INT	17	Idea	85	Armour Cloth, 1 point
POW	18	Luck	90	
DEX	9	Dodge	45	
CHA	10	Persuade	50	

HIT PTS. 0 1 2 3 4 5 6 7 8 [✓ 9] 10
11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

POW PTS. 0 1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 [✓ 18] 19 20 21 22 23 24 25

SKILLS	
CLIMB	65
FIRST AID	60
HIDE	60
JUMP	55
LISTEN	60
MOVE QUIETLY	30
SPOT HIDDEN	40
SWIM	30
THROW	55

WEAPONS	DAMAGE	ATTACK	PARRY	BRK PTS.
FIST	1D3	60		
ROCK	1D4	55		
STAFF	1D8	35	35	15

SPELL	%	SPELL	%
HEALING	35		
PROTECTION	25		
LIGHT	25		

Rokana is a beginning magic-user. She has learned three magic spells called HEALING, PROTECTION, and LIGHT. However, she has not yet mastered these spells. She has a 35 percent chance of successfully casting a HEALING spell and a 25 percent chance with PROTECTION or LIGHT.

Next time we will take Aloysious, Rokana, and perhaps some other characters to a county fair where they can have a wonderful time exercising their skills. In the meantime, we suggest you do some homework. Dig out the following back issues of THE RAINBOW and read "GameMaster's Apprentice."

August 1983 — pages 74-78
October 1983 — pages 170-174
November 1983 — pages 140, 144, 146, 148

Do any of you want us to run a small play-by-mail game? In this game, you would run one character like Aloysious or Rokana. You take your character to a county fair. Today they are called "Renaissance Faires," but in the world of Aloysious and Rokana they were contemporary fairs.

No previous experience is needed to play our play-by-mail game. Your only costs will be a copy of *Adventurer's Handbook* and some self-addressed, stamped envelopes. If you want to play, send a self-addressed, stamped envelope to DragonFun, P.O. Box 310, Menlo Park, CA 94026.

ROLE PLAYING GAMES

Millions of people play fantasy role playing games. A role playing game is a game in which one or more players create and play characters (adventurers) who live their imaginary lives in a specially made game world. The game world is created, managed, and operated by a GameMaster (GM), referee, or dungeon master (DM).

Most people who play role playing games use a formal rule system. Some of the best known are shown below.

Champions*. Hero Games, 92A 21st Avenue, San Mateo, CA 94402.*

Dungeons & Dragons (D&D)*. TSR, P.O. Box 756, Lake Geneva, WI 53147.*

RuneQuest (RQ)*. Chaosium, P.O. Box 6302, Albany, CA 94706.*

Traveller*. Game Designer's Workshop, P.O. Box 1646, Bloomington, IL 61701.*

Tunnels & Trolls (T&T)*. Blade, P.O. Box 1210, Scottsdale, AZ 85252.*

Beginners beware! The rule books are formidable. If you are a beginner, we suggest you start with one of the following books, both from Reston Publishing Company, 11480 Sunset Hills Road, Reston, VA 22090.

Adventurer's Handbook: A Guide to Role Playing Games *by Bob Albrecht & Greg Stafford.*

Through Dungeons Deep *by Robert Plamondon.*

In "GameMaster's Apprentice," we include how-to-play information for all beginners.

Copyright© 1984 by DragonQuest, P.O. Box 310, Menlo Park, CA 94026.

One-Liner Contest Winner . . .

This shows the moon with many stars in the background. Let it run for a while (a half hour or so); it gets better with age!

Mark Perry
Rutherfordton, NC

The listing:

```
0 PMODE4:PCLS:SCREEN1,1:CIRCLE(1
60,50),45,,.8:PAINT(160,50),1,1:
FORX=1TO99999999:PSET(RND(255),R
ND(192)):PRESET(RND(255),RND(192
)):NEXT'LET RUN FOR HALF A HOUR
OR SO.
```

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Adventure* and its companion *Rainbow Adventure Tape*.)

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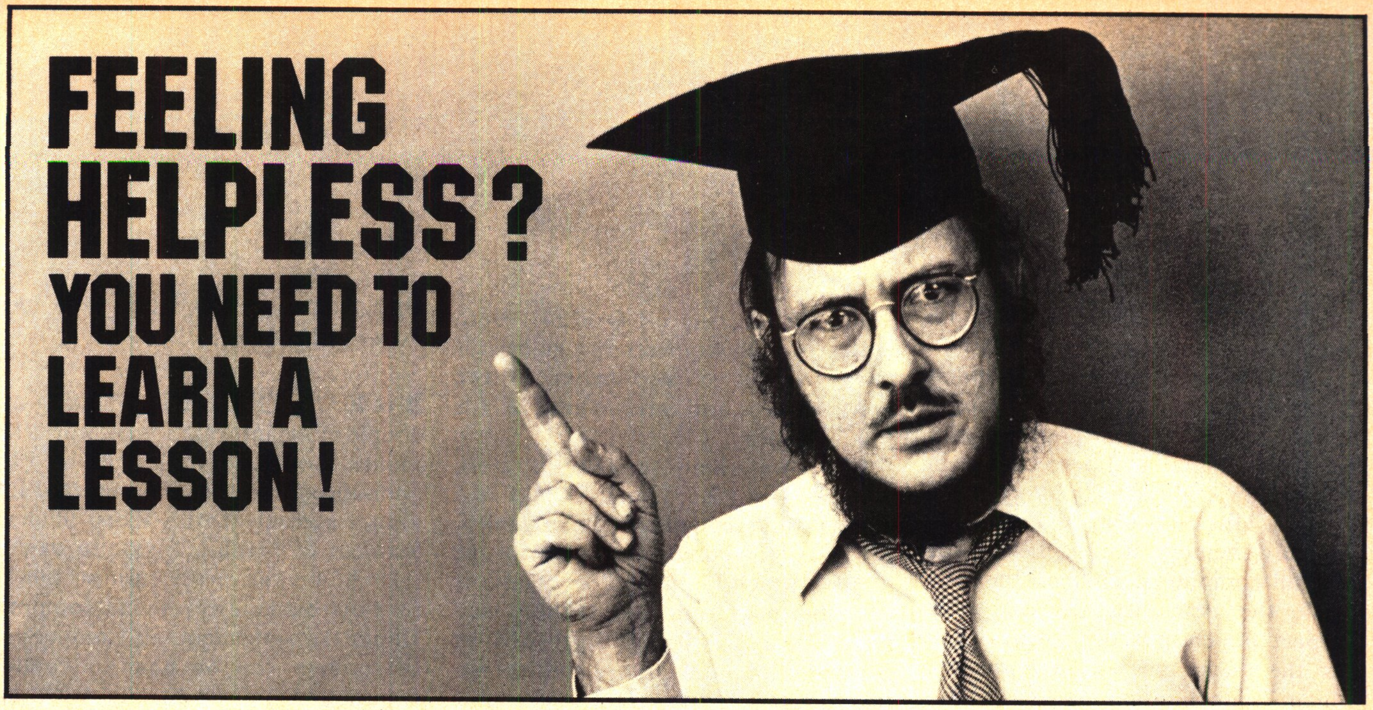

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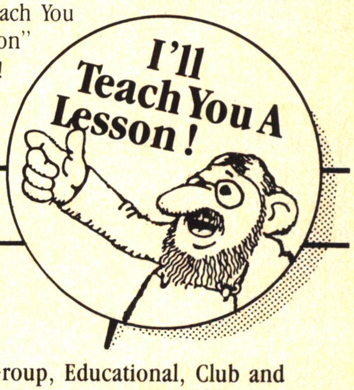
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The primary advantage of the CD-ROM is its 550-megabyte storage capacity on one side — the equivalent memory potential of 500 to 1,000 conventional 5¼-inch floppy disks. Additionally, the optical CD-ROM and its drive mechanism is free from magnetic mishaps and head/drive problems that plague the more conventional magnetic media and it has a built-in error detection and correction system.

For more information about the CD-ROM system, contact Robert Heiblim, Denon America, Inc., 27 Law Drive, Fairfield, NJ 07006; (201) 575-7810.

* * *

THE PRINTED WORD. Several recently released books are now available that Color Computer users might find interesting. First in the lineup are *The Computer Blue Book* and the *Orion Buyer's Guide to Computers*, published by Orion Research, 1315 Main Avenue, Suite 230, Durango, CO 81301. Both books are industry reference guides for both the buyer and seller in the marketplace and are available for $49.50 apiece.

Next we come to *Digital Deli*, authored by "the Lunch Group and Guests" and edited by Steve Ditlea. Billed as "the computer book with the human touch," this book combines contributions from 140 authors and artists into a 400-page *potpourri* of computer lore and culture and technological trivia. *Digital Deli* is available for $12.95 from Workman, 1 West 39 Street, New York, NY 10018.

If you're interested in success stories, there is *The Computer Entrepreneurs*, a look at the biggest names in the computer industry and how they made it to the top. Written by Robert Levering, Michael Katz and Milton Moskowitz, *The Computer Entrepreneurs* is an intimate portrait of these new cultural heroes. It is currently available for $19.95 from NAL Books, 1633 Broadway, New York, NY 10019.

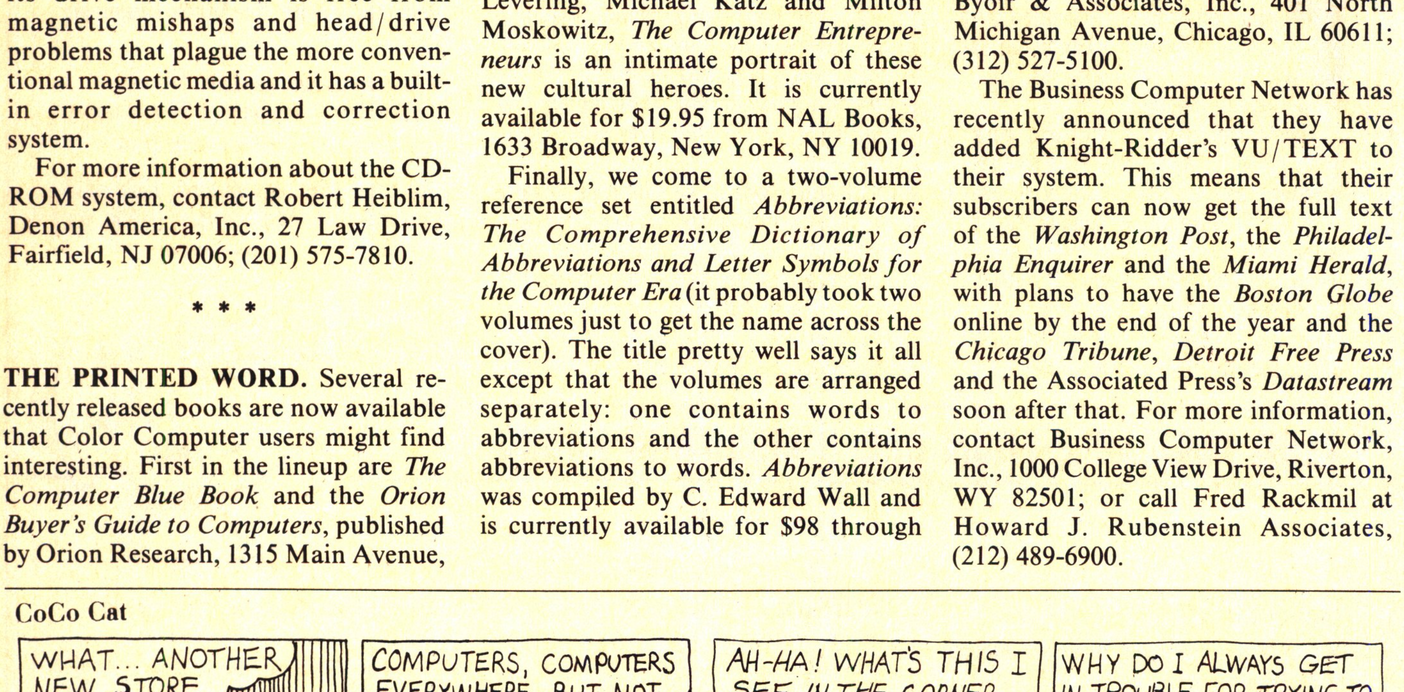
Finally, we come to a two-volume reference set entitled *Abbreviations: The Comprehensive Dictionary of Abbreviations and Letter Symbols for the Computer Era* (it probably took two volumes just to get the name across the cover). The title pretty well says it all except that the volumes are arranged separately: one contains words to abbreviations and the other contains abbreviations to words. *Abbreviations* was compiled by C. Edward Wall and is currently available for $98 through Pierian Press, P.O. Box 1808, Ann Arbor, MI 48106.

* * *

BACK ON THE LINE. Glancing at a couple of the information networks this month, CompuServe Incorporated has announced that they have entered into a joint agreement with VideoFinancial Services of Dallas, Texas, to expand their home and small business market for video banking by personal computer. Under the agreement, all CompuServe subscribers will be able to conduct transactions electronically with any bank in the country linked through VideoFinancial's computer gateway facilities. CompuServe will be the first nationwide computer network to offer this service, which is expected to be active on the system by March of 1985. For more information, contact Carl Byoir & Associates, Inc., 401 North Michigan Avenue, Chicago, IL 60611; (312) 527-5100.

The Business Computer Network has recently announced that they have added Knight-Ridder's VU/TEXT to their system. This means that their subscribers can now get the full text of the *Washington Post*, the *Philadelphia Enquirer* and the *Miami Herald*, with plans to have the *Boston Globe* online by the end of the year and the *Chicago Tribune*, *Detroit Free Press* and the Associated Press's *Datastream* soon after that. For more information, contact Business Computer Network, Inc., 1000 College View Drive, Riverton, WY 82501; or call Fred Rackmil at Howard J. Rubenstein Associates, (212) 489-6900.

CoCo Cat


WHAT... ANOTHER NEW STORE IN TOWN?
COMPUTERS, COMPUTERS EVERYWHERE BUT NOT A THING TO EAT!
AH-HA! WHAT'S THIS I SEE IN THE CORNER OF MY EYE? A MOUSE?
WHY DO I ALWAYS GET IN TROUBLE FOR TRYING TO DO SOME PEOPLE A FAVOR?
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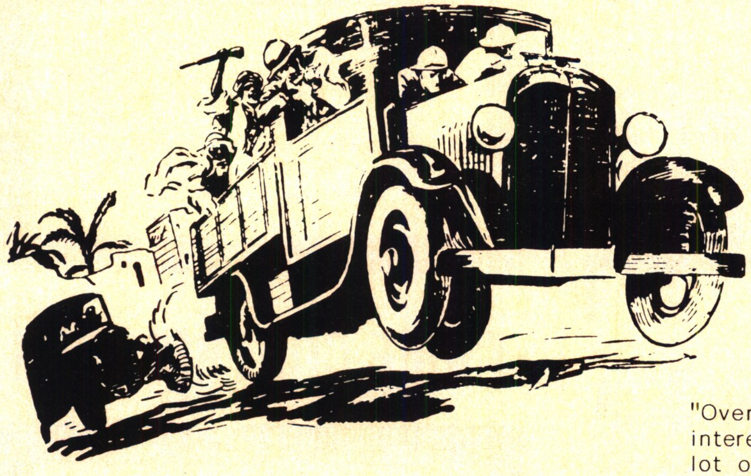
SPECTRUM ADVENTURE GENERATOR



The Spectrum Adventure Generator (SAG) allows you to create silent and talking adventure games that are 100% machine language and very fast in execution. Up to 99 rooms, 255 objects, 70 command words and 255 conditional flags can be used. Get a head start in next month's Rainbow Adventure Contest NOW! 32K/64K DISK **$39.95**

Note - Talking version requires Spectrum Projects' Voice Pak, a Disk "Y" Cable or Mulitpak and 64K.

Quotes from Jorge Mir (#1 CoCo Adventure Expert) from Dec'84 Rainbow Review -

"Overall, I think this is a great system for those interested in writing adventures. It sure eliminates a lot of time involved in developing them and allows the non-programmer to develop some very interesting Adventures since no programming knowledge is required. Try SAG, you'll like it!"

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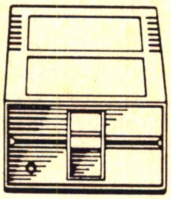

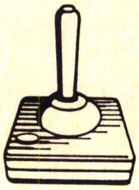

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The Hi-Res lowercase punctuation Interplanetary Fruit Fly Baby

By Martin Kaste

I'm sure most of you ambitious amateur programmers are familiar with the profound message of KISS, "Keep It Simple, Stupid!" Yet some people never seem to learn and continue slaving over thousand-line programs for months, only to watch them die slowly before their eyes on the screen, wondering where they went wrong. To me, the beauty of programming is that the most successful programs are usually the shortest, supported by a good idea, written in a few hours time and gradually perfected over a period of weeks.

This is true in the case of *The Interplanetary Fruit Fly*. It's short, simple and demonstrates a nifty little technique for displaying pseudo high-resolution graphics on the text screen: "lowercase punctuation."

You're probably asking, "A which?!"

Let me explain. "Lowercase punctuation" is what I call all the periods, commas, question marks, brackets, etc., which your trusty old CoCo uses, with a special twist. Using *POKEs*, we can display these punctuation marks and other characters the same way the computer displays lowercase letters: the white symbol on a black rectangular background. With these characters, using a little ingenuity, we can create just about any figure we please.

These symbols can't be *PRINTed,* but, as I said before, the *POKEs* come to our rescue. I know some of you beginning programmers may shy away a little from *POKEs*. But don't worry, these *POKEs* are all addressed to the video RAM part of the computer, and can't interfere with its normal functioning, so bear with me.

The *POKE* addresses we are going to use range from 1024 to 1535, one location for every one of the 512 characters on the text screen. Except for the symbols we're interested in, most of the 256 characters available with *POKE* can be *PRINTed*, some only with the use of *CHR$* codes. To save time, I have compiled a convenient list of the symbols we want and the value of each:

0 = @
1-26 = alphabet
27 = [
28 = \
29 =]
30 = ↑
31 = ←
32 = black rectangle
33 = !
34 = "
35 = #
36 = $
37 = %

38 = &
39 = '
40 = (
41 =)
42 = *
43 = +
44 = ,
45 = -
46 = .
47 = /
48 = 0
49 = 1
50 = 2

51 = 3
52 = 4
53 = 5
54 = 6
55 = 7
56 = 8
57 = 9
58 = :
59 = ;
60 = <
61 = =
62 = >
63 = ?

Now, let's get to the point. Type in the program listing, but be careful! There is one of those useful but occasionally dastardly speed up *POKEs* in Line 5. Before you run the program, save it on tape. If you want to run it before that, delete Line 5 and add it again when you're ready to save.

After the opening title, a green stripe appears at the top of the otherwise black screen displaying the current score, high score and number of shots remaining,

---

(Martin Kaste is an American high school student living in Brazil. He develops programs for local home computer owners on his Color Computer.)

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see NOV'83 Rainbow Review

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respectively. The game starts immediately, but can be stopped using the pause feature on the CoCo.

The Interplanetary Fruit Fly has already started to make irritating kamikaze dives at you, and all you have to defend yourself with are fifty shots of space age fruit fly repellent! You are controlling a cannon loaded with the stuff at the bottom of the screen, which you move with the left and right arrow keys. With the help of two *PEEKs*, your cannon has continuous smooth movement, meaning that it keeps traveling until you release the key. The fire button, which is the up-arrow key, also has this feature.

The action in the game is not difficult to explain. The movements of the cannon and the projectiles it fires are simple: *POKE* the figure into the new location, cover up its trail with black *POKE 32s.* The cannon travels at intervals of two spaces at a time, the projectile zips upward on a *FOR/NEXT* loop, jumping 32 spaces at a time for vertical movement. The Fly is a little more complicated, but not much. It flies down much the same way the projectile goes up, only the 32 spaces added each time are varied by a SIN(X) function, (Line 17). The result is a fly that weaves around and appears to dodge shots. As you probably guessed the flapping of its wings is an illusion caused simply by switching the parentheses back and forth, open and closed, in each step.

The player is awarded 500 points when he or she "wings" the Fly, 1,000 when the player manages to kill it, blasting the center of its body with the deadly repellent, and a new one takes its place almost instantly. The game ends if and when the Fly touches your cannon or when you run out of shots, whichever comes first. I suggest you ration your shots, because they go quickly, so try to shoot only when the Fly is in range. Another tip: try not to let yourself be fenced into the corners; they're perfect for the Fly to nail you.

One last note for those of you with Extended Color BASIC. You may want to liven up the game a bit by substituting the *SOUND* commands with faster, more exotic *PLAYs*. I use *PLAY"T 4505D04E03A#02DD01AADA"* in Line 10, *PLAY"T50D"* in Line 19, *PLAY"T50;01ADDE#D#AACA"* in Line 24, and *PLAY"T250;01A A05D03CCCCC"* in Line 28. You can think up something much better, I'm sure. Also, feel free to change any characters that I used in the game. The program layout is simple enough to allow you to make all kinds of modifications.

Enjoy and happy spritzing!

17 223
END 166

The listing:

```
0 '***THE******INTERPLANETARY***
1 '******FRUIT****FLY***********
2 'BY***MARTIN*OLAF*KASTE********
3 '**********MAY*1984************
4 '******************************
5 POKE65495,0
6 CLS0
7 FORA=1186TO1213
8 FORC=C TO C+5:POKEA,RND(26):NE
XTC
9 PRINT@162,MID$("the"+CHR$(128)
+"interplanetary"+CHR$(128)+"fru
it"+CHR$(128)+"fly",1,A-1186);:S
OUNDC,1:NEXTA
10 PRINT@189,"y";:FORA=1TO4:SOUN
D50,1:SOUND75,3:SOUND150,3:SOUND
2,1:SOUND3,1:PRINT@200,"by"+CHR$
(128)+"martin"+CHR$(128)+"kaste"
;:POKE1480,40:POKE1481,3:POKE148
2,41:POKE1483,32:PRINT@462,"smar
tsoft";:NEXT
11 FORN=1056TO1535:POKEN,32:NEXT
N
12 PRINT@0," "
13 PRINT@1,"0000";:PRINT@22,"SHO
TS:";:PRINT@29,"50";:IFHS=0THEN1
4ELSEPRINT@12,HS;
14 SH=50:XY=40:YX=41
15 A=1516
16 Z=1056+RND(32):IFSH=<0THEN24
17 POKEZ,32:POKEZ+1,32:POKEZ+2,3
2:IFZ>1503THEN16ELSEZ=Z+SIN(M)*R
ND(3):Z=Z+32:M=M+1:POKEZ,XY:POKE
Z+1,43:POKEZ+2,YX:CC=XY:XY=YX:YX
=CC
18 IFZ<A+3ANDZ>A-2THEN24
19 IFPEEK(341)=247THENFORC=A-31T
O1056STEP-32:POKEC,42:POKEC+32,3
2:NEXTC:POKEC+32,32:SH=SH-1:PRIN
T@28,SH;:IFPEEK(Z+1)=32THENS=S+1
000:GOSUB28:PRINT@1,S;:POKEZ,32:
POKEZ+1,32:POKEZ+2,32:GOTO16:ELS
EIFPEEK(Z)=32ORPEEK(Z+2)=32THENS
OUND50,1:S=S+500:PRINT@1,S;
20 IFSH=0THEN24
21 IF PEEK(343)=247THENB=-2:IFA=
1504THENB=0
22 IF PEEK(344)=247THENB=2:IFA=1
532THENB=0
23 POKEA,32:POKEA+1,32:POKEA+2,3
2:A=A+B:B=0:POKEA,47:POKEA+1,42:
POKEA+2,28:GOTO17
24 SOUND1,2:SOUND13,1:SOUND1,3:S
OUND2,4:SOUND1,2:FORA=1TO300:NEX
T
25 PRINT@33,"TO PLAY AGAIN, PRES
S THE A KEY";:A$=INKEY$:IFA$<>"A
"THEN25
26 IF HS<=S THEN HS=S
27 S=0:GOTO11
28 POKEZ,62:POKEZ+2,60:POKEZ-31,
22:POKEZ+33,1:SOUND50,1:SOUND150
,2:SOUND123,1:SOUND140,3:POKEZ,3
2:POKEZ+1,32:POKEZ+2,32:POKEZ-31
,32:POKEZ+33,32:RETURN
```

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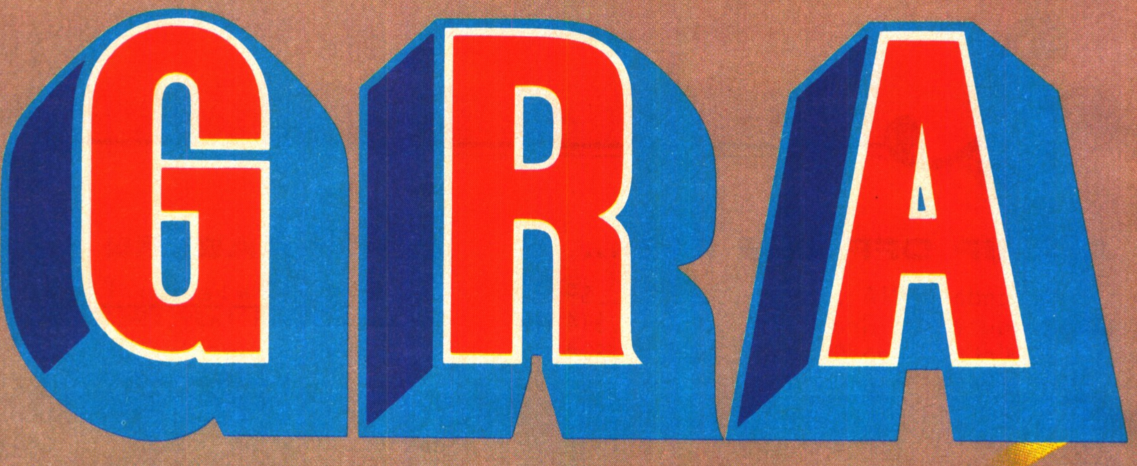

Graphics Quickies

The Line Box

By Kevin Oberberger

```
10 PMODE3,1:PCLS1:SCREEN1,1
20 CIRCLE(128,95),85,4:CIRCLE(12
8,95),60,4:PAINT(128,30),4,4
30 LINE(165,50)-(70,115),PSET:LI
NE(185,70)-(85,137),PSET:PAINT(1
00,95),4,4
40 CIRCLE(128,95),36,2,1,.26,.35
:DRAW"BM116,129C2M-2,+8M-10,+7BM
86,105M-6,-5"
50 CIRCLE(53,82),32,2,1,.1,.24:D
RAW"BM51,111F4G2H4L7F2L7G4H2E6L7
G2H2E4R2BL2M-4,-1H2L2U1E2M+10,+3
M+20,+1BL2M+14,-25M+6,-8M+2,-2M+
4,-2"
60 CIRCLE(88,57),18,2,1,.3,.7:CI
RCLE(108,54),18,2,1,.85,.2:CIRCL
E(102,30),20,2,1,.5,.8:DRAW"BM82
,40E2U7":CIRCLE(102,30),20,2,1,.
87,.1
70 CIRCLE(113,25),20,2,1,.65,.85
:DRAW"BM118,12E7R4D6M-8,+8":CIRC
LE(140,88),38,2,1,.7,.83:LINE(15
9,54)-(86,105),PSET:PAINT(90,80)
,1,2:PAINT(90,60),1,2
80 DRAW"BM173,81E7F2M+22,-8R2D2M
-10,+4G3BE2M+6,-1M+6,+1F2D1L9G2M
+10,+4G2M-10,-4L9G5L2H2U3L4H2":P
AINT(180,78),1,2
90 CIRCLE(94,29),2,2,2:CIRCLE(10
4,29),2,2,2:DRAW"BM96,56F2E2U2H2
G2D2":PAINT(98,55),2,2:DRAW"BM96
,66F2E3BU24G3H2BU22BL2G4BR18BU1H
3"
100 GOTO 100
```

16K
ECB

PHIC

Nova

By Michael Rosenberg
and
Tobin Wonn

```
10 '     **** N O V A ****
20 '  BY MICHAEL ROSENBERG
30 '           AND
40 '         TOBIN WONN
50 '       MAY 10, 1984
60 PCLEAR8
70 PMODE 4,1:PCLS:SCREEN1,1
80 FORJ=0TO255STEP2
90 LINE(J,191)-(128,96),PSET:NEX
T
100 FORJ=0TO255STEP2
110 LINE(J,0)-(128,96),PSET:NEXT
120 FORJ=0TO191STEP2
130 LINE(128,96)-(255,J),PSET:NE
XT
140 FORJ=0TO191STEP2
150 LINE(128,96)-(0,J),PSET:NEXT
160 PMODE4,5:PCLS:SCREEN1,1
170 FORJ=0TO255STEP4
180 LINE(J,191)-(128,96),PSET:NE
XT
190 FORJ=0TO255STEP4
200 LINE(J,0)-(128,96),PSET:NEXT
210 FORJ=0TO191STEP4
220 LINE(128,96)-(255,J),PSET:NE
XT
230 FORJ=0TO191STEP4
240 LINE(128,96)-(0,J),PSET:NEXT
250 FORX=1TO5STEP4
260 PMODE3,X:SCREEN1,1:FORY=1TO1
00:NEXTY,X
270 GOTO250
```

No Ghosts

By Balinda Fortman

```
1 POKE65495,0
2 PMODE1,1
3 PCLS3
4 SCREEN1,0:POKE65314,248
5 FORX=3TO7
6 FORY=2TO6
7 FORZ=0TO3
8 COLORZ
9 A=0:B=255:C=0:D=191
10 LINE(A,C)-(B,D),PSET,B
11 A=A+Y:B=B-Y:C=C+X:D=D-X
12 IFA<255ANDC<191THEN10
13 NEXTZ
14 NEXTY,X
15 RUN
```

An Optical Illusion

By Bryan Kerr

```
1 ' AN OPTICAL ILLUSION
2 ' BRYAN KERR
3 ' 1195 BRIARWOOD DR
4 ' JACKSON,MS   39211
5 ' 8/17/83
10 PMODE3,1:PCLS:SCREEN1,0
20 A$="C4D30M-30,-15U30NM+30,+15
M+30,-15M+30,+15NM-30,+15D30M-30
,+15U30"
30 DRAW"S3XA$;BM-80,-40XA$;BM+80
,-40XA$;BM+80,+40XA$;BD80XA$;BM-
80,+40XA$;BM-80,-40XA$;"
40 B$="C1BM-30,+15C1NU8D2NM+8,+4
```

```
U2BM+30,-15":C$="C1BM+30,+15NU8D
2NM-8,+4U2BM-30,-15":D$="C1BU29N
M-8,+4NM+8,+4BD29"
50 E$="C4BM-30,-15M-40,-20D10M+4
0,+20U10M+10,-5M-40,-20M-10,+5M+
40,+20BM+30,+15"
60 F$="C4BD31D40NM-8,-4M+8,-4U40
BM-8,+4BM-8,-4ND40BM+8,+4BU31"
70 G$="C4BD1M+30,-15M+40,-20NM-8
,-4D10M-40,+20U10M-10,-5NM+40,-2
0M+10,+5M-30,+15"
80 DRAW"BM128,96C4XA$;BU2XB$;XC$
;XD$;BD80XD$;BM-80,-40XC$;XD$;BU
80XC$;BM+80,-40XB$;XC$BM+80,+40X
B$;BD80BM+80,+40XD$;XB$;XE$;BU80
XB$;BD80BM-80,+40XG$;XE$;BM-80,-
40XG$;BU80XF$;XG$;BM+80,-40XF$;B
M+80,+40XE$;XF$BM-80,+40XE$;XF$;
BM-80,+40XG$;XE$;XF$;
90 FOR C=2TO3:FORT=1TO15:READX,Y
:PAINT(X,Y),C,4:NEXTT,C
100 FOR T=1TO7:READX,Y:PAINT(X,Y
),4,4:NEXTT
110 DATA 128,94,130,153,128,30,1
60,74,188,60,68,60,96,74,96,49,1
58,49,68,120,188,120,116,100,140
,100,105,140,152,140
120 DATA 135,95,130,160,130,37,1
90,75,190,135,70,135,70,75,130,8
5,130,135,118,105,95,56,165,80,1
58,145,190,95,70,95
130 DATA 103,65,151,65,158,95,98
,95,103,125,158,125,128,0
140 GOTO140
```

The Hole

By Gregg A. Ford

```
1 'CIRCLE2
2 'GREGG FORD
3 '95 ELDRED BEDFORD,OHIO 44146
10 PMODE 4,1:PCLS:SCREEN 1,1:FOR
 X=10 TO 170 STEP 2
20 CIRCLE(128,96),X,7
30 NEXT
40 CLS:FOR X=10 TO 170 STEP 5
50 CIRCLE(128,96),X,7
60 NEXT
70 FOR X=10 TO 170 STEP 10
80 CIRCLE(128,96),X,2
90 NEXT
100 FOR X=0 TO 170 STEP 4
110 CIRCLE(128,96),X,3
120 NEXT
130 FOR X=0 TO 170 STEP 15
140 CIRCLE(128,96),X,0
150 NEXT
160 FOR X=10 TO 170 STEP 9
170 CIRCLE(128,96),X,4
180 NEXT
190 FOR X=10 TO 170 STEP 3
200 CIRCLE(128,96),X,5
210 NEXT
220 FOR X=10 TO 170 STEP 1
230 CIRCLE(128,96),X,6
240 NEXT
250 FOR X=10 TO 170 STEP 2
260 CIRCLE(128,96),X,7,2
270 NEXT
280 FOR X=10 TO 170 STEP 3
290 CIRCLE(128,96),X,8,2
300 NEXT
310 FOR X=0 TO 170 STEP 5
320 CIRCLE(128,96),X,0,2
330 NEXT
340 FOR X= 10 TO 170 STEP 7
350 CIRCLE(128,96),X,1,2
360 NEXT
370 FOR X=0 TO 170 STEP 1
380 CIRCLE(128,96),X,6
390 NEXT X
420 CLS:PRINT@232,"THAT'S ALL FO
LKS!"
430 GOTO 430
```

The Impossible Cube

By Stephen Lai

```
5 '      IMPOSSIBLE CUBE
10 PMODE4,1:PCLS:SCREEN1,0
20 DRAW"S44BM34,3NFR12NM-1,2F5NM
-2,1D12NH2L12NEH5NU12URNM+2,1ER3
D2L2F2NU8M+1,2ENR8U3NR3U2NR3U3NR
3HNELH3ND7M-1,-2M+3,1NF3R7F4D9UH
3U4NR3U2NR2U2HLD3NL3D5FNRGF3"
30 FORF=1TO8:READA,B:PAINT(A,B):
NEXT:DATA0,0,100,30,60,70,140,90
,190,90,170,50,140,160,76,140
40 GOTO40
```

Pascal's Triangle

By Stephen Lai

```
5 '      PASCAL'S TRIANGLE
10 DIM P(256)
20 PMODE 4,1:PCLS:SCREEN 1,1
30 P(128)=1
40 FOR S=1 TO 127
50 FOR F=128-S TO 128+S STEP 2
60 P(F)=P(F-1)+P(F+1)-SGN(P(F-1)
+P(F+1))*2
70 PSET(F,S,P(F)+5)
80 NEXT F,S
90 GOTO 90
```

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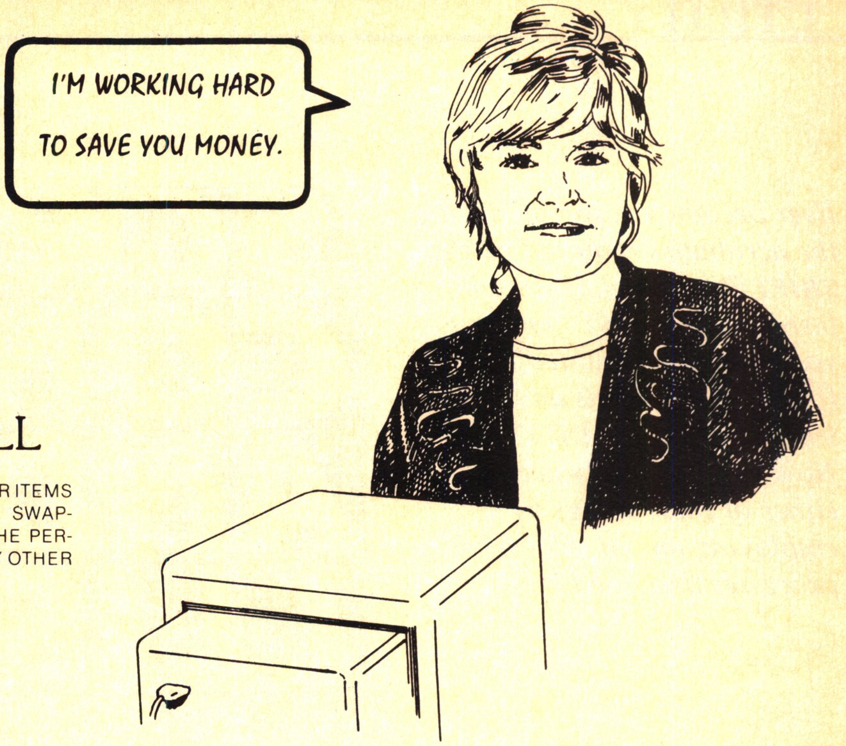
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Ever become exasperated with the acrobatics required by the SHIFT @ *method of stopping a fast-scrolling* LIST*? Or have you sometimes wanted to format the margins and line length of your* LLISTINGS*? Now you can easily accomplish either of these things by employing one of the useful processes described here.*

SCROLL CONTROL AND LLIST MASTERR

By H. Allen Curtis

This article concerns two programs which produce new varieties of CoCo's *LIST* and *LLIST* commands. The programs apply regardless of the size of RAM or the type of BASIC in your CoCo.

Have you ever become exasperated trying to use SHIFT @ to stop the listing process at an appropriate place? The program of Listing 1 was written to avert such exasperation. This program offers you the option of two different varieties of *LIST* commands. Henceforth, the program of Listing 1 will be referred to as *Lister*.

Under the first option, *Lister* will produce a slow *LIST* command. With that *LIST* command, the scrolling of the BASIC lines will take place slowly. The slowed scrolling gives you the needed SHIFT @ control in the strategic stopping of the listing process. This *LIST* variety can operate at any one of five different speeds. You may choose the speed you find to be most convenient.

The second *LIST* variety operates at the normal speed, but without scrolling. With this variety, when the screen is filled to a point where scrolling would ordinarily occur, listing is automatically stopped. You then must press ENTER for the screen to clear and the listing to resume at the top of the screen. Rather than stopping the listing process with SHIFT @, you must press ENTER to start it.

> ***". . . you may modify* LIST *and* LLIST *to meet your particular needs. Disassemblies of the machine language subroutines associated with* Lister *and* LLister *should prove helpful in making modifications."***

The key to producing the two *LIST* varieties is the employment of the "hook" at RAM addresses 422 through 424. This hook connects the ROM routine for the *LIST* command with RAM. This hook is not used by Color BASIC, Extended Color BASIC or Disk BASIC. Therefore, it is available to use in the alteration and improvement of the *LIST* command.

In the slow *LIST* variety, the hook is made to connect the ROM's *LIST* routine with a machine language subroutine residing at the 61 highest RAM locations of your CoCo. In the no-scroll variety of *LIST*, the hook connects the *LIST* routine and a 43-byte machine language subroutine stored in high RAM.

The values in the *DATA* statements of lines 180 and 190 of *Lister* are the 16 bytes comprising the subroutine associated with the slow *LIST*. Likewise, the values of the remaining *DATA* statements, lines 200 through 260, are the bytes that comprise the subroutine associated with the no-scroll *LIST* command.

Lines 10 through 40 are employed to store the subroutine of slow *LIST* in high RAM as well as setting the appropriate hook address. Lines 90 through 110 along with Line 130 serve a similar purpose for the no-scroll *LIST*. Line 170 completes the connection between the ROM's *LIST* and the selected variety. Line 120 checks the accuracy of your typing of the *DATA* statements.

Except for Line 5, the other lines of *Lister* are concerned with prompts to aid you in taking your *LIST* variety options. The *REM* of Line 5 informs

---

(H. Allen Curtis resides in Williamsburg, Va. He is interested in 17th and 18th century history and enjoys biking through the colonial capital. He balances past and present with his computer work.)

Listing 1:

120 122
END 87

```
5 REM TO RETURN TO NORMAL LIST
      POKE422,57
10 X=256*PEEK(116)+240:CLEAR100,
X-1
20 X=256*PEEK(116)+240
30 FORI=0TO15:READA:POKEX+I,A:NE
XT
40 POKE423,PEEK(116):POKE424,240
50 CLS:PRINT@134,"CHOOSE LIST VA
RIETY":PRINT@166,"BY PRESSING 1
OR 2
60 PRINT:PRINT"  1. SLOW":PRINT:
PRINT"  2. NO SCROLL
70 K$=INKEY$:ON VAL(K$) GOTO140,
90
80 GOTO70
90 X=256*PEEK(116)+213:CLEAR100,
X-1
100 X=256*PEEK(116)+213:FORI=0TO
15:READA:B=B+A:NEXT
110 FORI=0TO42:READA:B=B+A:POKEX
+I,A:NEXT
120 IFB<>6844THENCLS:PRINT"DATA
ERROR":STOP
130 POKE424,213:POKE422,126:END
140 CLS:PRINT@164,"FOR A FASTER
SLOW LIST":PRINT"     PRESS A NUM
BER KEY FROM":PRINT"           1 TH
ROUGH 4.":PRINT"    OTHERWISE, P
RESS ENTER.
150 K$=INKEY$:K=VAL(K$):IFK<5 AN
D K>0 THEN160ELSEIFK$=CHR$(13)TH
EN170ELSE150
160 K=256/2^K:POKE256*PEEK(116)+
249,INT(K+.5)
170 POKE422,126:END
180 DATA 52,16,134,254,145,111,3
9,6
190 DATA 142,0,0,189,167,211,53,
144
200 DATA 220,136,159,66,227,132
210 DATA 147,66,16,131,5,224,44
220 DATA 1,57,182,2,220,129,155
230 DATA 39,248,129,182,39,244
240 DATA 52,16,189,163,144,189
250 DATA 169,40,48,95,189,185
260 DATA 156,12,137,53,144
```

you how to return to the normal *LIST* from either variety of *LIST*.

The subroutines of both *LIST* varieties will occupy the same RAM area as RAINBOW Check Plus. Therefore, if you make use of RAINBOW Check Plus as an aid in the correct typing of *Lister*, do not run *Lister* until it has been completely and accurately typed.

After correctly typing *Lister*, save it on tape or disk, then *RUN* it. You will quickly receive the first prompt. To test *Lister* initially, press the '1' key to select the slow *LIST* variety. Doing this immediately produces another prompt. The slow *LIST* will operate at one of five speeds. Pressing ENTER will make it operate at its slowest speed. Pressing 1, 2, 3 or 4 will, respectively, make it operate at two, four, eight or 16 times the speed of the slowest *LIST*.

Press ENTER to get the slowest *LIST*. Then type *LIST*, press ENTER, and test the use of SHIFT @ to stop the listing process. Run *Lister* four more times. Each time select the slow *LIST* variety, but at a different speed. Determine what speed is most convenient for you by *LISTing Lister* and stopping it by means of SHIFT @.

In another run of *Lister*, select the no-scroll *LIST* variety, then *LIST* the program. Note that the listing stopped after completing only BASIC Line 5. Listing Line 10 would have caused scrolling, so the process was stopped.

Listing 2:

```
10 CLS:X=256*PEEK(116)+194:CLEAR
100,X
20 X=256*PEEK(116)+195
30 FORZ=X TOX+60
40 READA:B=B+A:POKEZ,A:NEXT
50 IFB<>5998THENPRINT"DATA ERROR
":STOP
60 PRINT@231," ";:INPUT"MARGIN";
M
70 POKEX+60,M
80 INPUT"          LINE LENGTH";L
90 L=L+M:POKEX+43,L
100 IFPEEK(32768)<>69THENPOKEX+1
1,57
110 IFPEEK(186)=6THENPOKEX+12,13
0:POKEX+13,115ELSEPOKEX+12,203:P
OKEX+13,74
120 POKE360,PEEK(116):POKE361,19
5
130 DATA 52,124,246,2,220,193
140 DATA 155,39,5,53,124,57,0,0
150 DATA 48,140,42,129,13,39,34
160 DATA 230,132,38,16,230,1,52
170 DATA 6,231,132,134,32,189
180 DATA 162,133,90,38,248,53,6
190 DATA 92,193,80,39,4,231,132
200 DATA 32,215,189,162,133,134
210 DATA 13,111,132,32,206,0,0
```

Pressing ENTER permits the nearly full screen display of lines 10 through 80. By pressing ENTER again, you will be shown lines 90 through 140. Two more similar presses of ENTER will complete the program listing. As you have seen, the no-scroll *LIST* lets you examine BASIC lines at your own pace.

Setting Margins With *LLister*

Would you like to start a notebook of program listings? Or, would you like to have the ability to select the left margin size and the number of characters per line of any hard copy listing? If so, the program of Listing 2 should be of interest to you. The product of this program, called *LLister*, is a new variety of *LLIST* command that allows you to format your hard copy listings insofar as left and right margins are concerned.

Another hook, at addresses 359 through 361, is the key to the development of a new variety of *LLIST* command. The *DATA* statements (lines 130 through 210) of *LLister* comprise a 61-byte machine language subroutine that will be connected via the hook to the ROM's *LLIST* command routine. Lines 10 through 40 of *LLister* are concerned with storing the aforementioned subroutine at the highest 61 RAM locations. Line 50 provides a check on the accuracy of your *DATA* values typing.

Both Extended Color BASIC and Disk BASIC make use of the hook at addresses 359-361, but Color BASIC does not. *LLister* sets a hook address entry to the 61-byte machine language subroutine. For systems with Extended Color BASIC or Disk BASIC, *LLister* also sets the subroutine exit address, which is the replaced hook address entry to the appropriate BASIC ROM. Lines 100 through 120 are used to set up the hook address and the exit address, if needed.

The remaining lines of *LLister* provide prompts to enable you to specify the desired left margin size and the number of characters per line.

A high RAM conflict exists between *LLister* and RAINBOW Check Plus. When using the latter, do not run *LLister* until it has been typed correctly. If you are using a new *LIST*, type and ENTER *POKE422,57* to disable it before running *LLister*.

When you have finished the required typing, save *LLister* on tape or disk. Turn your computer off and turn on your printer and CoCo in the recommended sequence. *LOAD LLister* and *RUN* it.

A MARGIN prompt will soon appear

```
ADDRESS  HEX CODE     MNEMONIC  OPERAND     COMMENT

 3FF0     34 10        PSHS      X          ;Save X
 3FF2     86 FE        LDA       #FE        ;A is printer device
                                             number
 3FF4     91 6F        CMPA      6F         ;Is LLIST current
                                             command?
 3FF6     27 06        BEQ       3FFE       ;If so, go to exit
 3FF8     8E 00 00     LDX       #0000      ;X is delay constant
                                             (POKEd from BASIC
                                             for speeds 1 thru 4)
 3FFB     BD A7 D3     JSR       A7D3       ;Delay
 3FFE     35 90        PULS      PC,X       ;Restore X and exit
```

Table 1

```
ADDRESS  HEX CODE     MNEMONIC  OPERAND     COMMENT

 3FD5     DC 88        LDD       88         ;D is cursor position
 3FD7     9F 42        STX       42         ;Save line address
                                             pointer
 3FD9     E3 84        ADDD      ,X         ;Add next pointer
 3FDB     93 42        SUBD      42         ;D is cursor position
                                             if current line were
                                             listed
 3FDD     10 83 05 E0  CMPD      05E0       ;Would cursor be on
                                             bottom screen line?
 3FE1     2C 01        BGE       3FE4       ;If so, branch
 3FE3     39           RTS                  ;Exit
 3FE4     B6 02 DC     LDA       02DC       ;A is current command
                                             token
 3FE7     81 9B        CMPA      #9B        ;Is command LLIST?
 3FE9     27 F8        BEQ       3FE3       ;If so, go to exit
 3FEB     81 B6        CMPA      #B6        ;Is command EDIT?
 3FED     27 F4        BEQ       3FE3       ;If so, go to exit
 3FEF     34 10        PSHS      X          ;Save X
 3FF1     BD A3 90     JSR       A390       ;Wait for ENTER to be
                                             pressed
 3FF4     BD A9 28     JSR       A928       ;Clear screen
 3FF7     30 5F        LEAX      -1,U       ;X points to ASCII
                                             representation of
                                             current line number
 3FF9     BD B9 9C     JSR       B99C       ;Print line number
 3FFC     0C 89        INC       89         ;Bump cursor position
 3FFE     35 90        PULS      PC,X       ;Restore X and exit
```

Table 2

on the screen. The prompt requires you to type the margin size. A frequently used margin size is 10 characters long. Thus, type 10 and press ENTER.

The next prompt asks you to specify the line length. For an 80-column printer, 60 characters per line will yield left and right margins of 10 characters each. Therefore, type 60 and press ENTER.

Test the new *LLIST* command by using it to *LLIST LLister. RUN LLister* several times and try *LLISTing* with different margin and line length selections. If the selected margin size and line length total more than 80 characters, *LLister* will reduce the line length to 80 minus the margin size.

LLister as presented does not have any effect on the *PRINT#-2* command, but it can easily be made to do so. If you would like to employ *LLister* to select and use margins and line lengths on other matter as well as BASIC programs, make the following changes in *LLister*: in Line 130 replace values 246, 2 and 220 with 214, 111 and 18. In Line 140 replace the value 155 with 254. Finally, in Line 50 replace the checksum 5998 with 5972.

As *Lister* and *LLister* were written, the new varieties of *LIST* and *LLIST* cannot concurrently be a part of BASIC's vocabulary. The new *LIST* and *LLIST* commands can be made to belong to BASIC's repertoire by making the following changes in *Lister*: in lines 10, 20 and 40 replace the number 240 with 179. Similarly, in lines 90, 100 and 130 replace 213 with 152. Then save the changed *Lister* on tape or disk.

When adding both the new *LIST* and *LLIST* commands to BASIC's vocabulary, you must *LOAD* and *RUN LLister* before doing the same with the changed *Lister*.

Some of you may be interested in further modifying *LIST* and *LLIST* to meet your own particular needs. Disassemblies of the machine language subroutines associated with *Lister* and *LLister* should prove helpful to you in making such modifications. Disassemblies of the slow *LIST*, no-scroll *LIST* and *LLIST* subroutines are presented in Tables 1, 2 and 3.

In the tables all numbers and addresses have been expressed in hexadecimal, so there is no need to use the symbol '$' to indicate that a given number or address is in hexadecimal. The table addresses correspond to those used with a CoCo having a 16K byte RAM. For a 32K RAM mentally add 4000 hexadecimal to each of those addresses.

```
ADDRESS  HEX CODE     MNEMONIC  OPERAND     COMMENT

 3FC3     34 7C        PSHS     UXYB,DP  ;Save registers
 3FC5     F6 02 DC     LDB      02DC     ;B is command token
 3FC8     C1 9B        CMPB     #9B      ;Is it LLIST token?
 3FCA     27 05        BEQ      3FD1     ;If so, branch
 3FCC     35 7C        PULS     UXYB,DP  ;Restore registers
 3FCE     7E 00 00     JMP      0000     ;Exit set by POKEs
 3FD1     30 8C 2A     LEAX     2A,PC    ;X points to current
                                          character count
 3FD4     81 0D        CMPA     #0D      ;Is character
                                          carriage return?
 3FD6     27 22        BEQ      3FFA     ;If so, branch
 3FD8     E6 84        LDB      ,X       ;B is current
                                          character count
 3FDA     26 10        BNE      3FEC     ;Branch if not start
                                          of new line
 3FDC     E6 01        LDB      1,X      ;B is margin size
 3FDE     34 06        PSHS     B,A      ;Save margin size and
                                          current character
 3FE0     E7 84        STB      ,X       ;Set character count
                                          to margin size
 3FE2     86 20        LDA      #20      ;A is space
 3FE4     BD A2 85     JSR      A285     ;Line print space
 3FE7     5A           DECB              ;Have all margin
                                          spaces been printed?
 3FE8     26 F8        BNE      3FE2     ;If not, loop
 3FEA     35 06        PULS     B,A      ;Restore margin size
                                          and current
                                          character
 3FEC     5C           INCB              ;Bump B
 3FED     C1 50        CMPB     #50      ;Have all characters
                                          of current line
                                          been printed?
 3FEF     27 04        BEQ      3FF5     ;If so, branch
 3FF1     E7 84        STB      ,X       ;Save current
                                          character count
 3FF3     20 D7        BRA      3FCC     ;Prepare to exit
 3FF5     BD A2 85     JSR      A285     ;Line print final
                                          character of line
 3FF8     86 0D        LDA      #0D      ;A is carriage return
 3FFA     6F 84        CLR      ,X       ;Zero character count
 3FFC     20 CE        BRA      3FCC     ;Prepare to exit
 3FFE     00                             ;Current character
                                          count
 3FFF     00                             ;Margin size
```

Table 3

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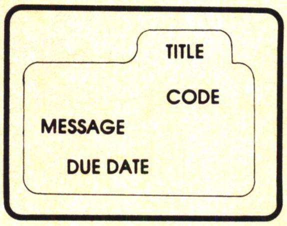

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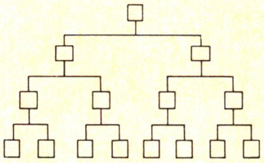

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Like Sands Through The Hourglass . . .

ONE MOMENT
PLEASE !
Mary Crooks

By Mary Crooks

Hourglass is a short graphics routine for visual entertainment. It fills a time delay or visual gap in the on-screen proceedings. You can use it as a subroutine in programs you create that need such a time filler. If you add it to the "20 Odd-Ball Screen Routines" by Gregory Clark in THE RAINBOW, Jan. 1984, then you will have quite a collection from which to choose.

A Color Computer 16K Extended BASIC is required. Type *RUN* and the program writes the words "Please Wait" on the screen, then draws an hourglass. The sand in the hourglass falls for an interval of time that you can change to fit your needs. Lines 10-20 reserve memory for variables and determine the graphics mode. Lines 30-110 draw the cursive letters and assign them a variable name. The actual drawing of the words happens in Line 120 using *DRAW* and concatenation (adding together) of the variables. The rest of the program constructs and colors the hourglass and creates the falling sand particles. The time delay is for ten seconds. You can change the timing interval in Line 230 by increasing or decreasing the 50 in the *FOR NEXT* loop.

If you use *Hourglass* as a subroutine, include *CLEAR 350* at the start of your main program and delete it from the subroutine. Call the subroutine with a *GOSUB* from the place in your program that it is needed, then change Line 260 to read *RETURN*.

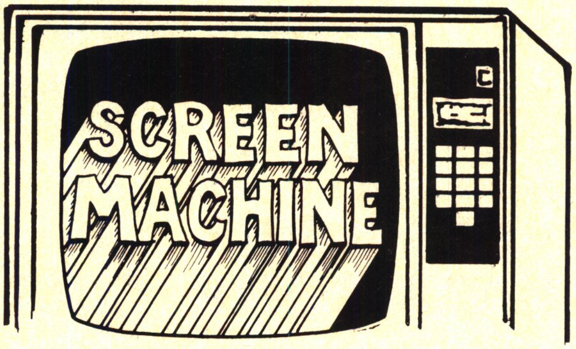
(Mary Crooks, a housewife and mother of two, has been programming for about a year. She is currently helping to organize and run the computer center at her son's elementary school. She holds a degree in art and enjoys all things creative.)

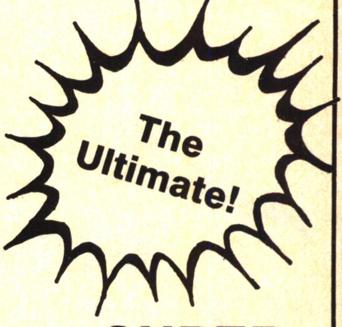
The listing:

```
10 CLEAR 350
20 PMODE4,1:PCLS:SCREEN 1,0
30 AP$="EU2UNHNUER2FDGL2HBD3BR4"
40 BL$="BRRE2U3HGD4FR"
50 BE$="RE2HGF2R"
60 BA$="RU2ERFDNFGLHBDBR4"
70 BS$="REU2F2GNHR2"
80 AW$="BU5FD3FENU4FEU3EBD5"
90 BI$="REU2BUNEBD3DRBR"
100 BT$="REU3NL2NR2NUBD3FR"
110 SS$="BR5"'SPACE
120 DRAW"S8BM20,20"+AP$+BL$+BE$+
BA$+BS$+BE$+SS$+AW$+BA$+BI$+BT$+
SS$
130 CIRCLE(126,60),30,,.25
140 CIRCLE(126,152),30,,.25
150 LINE(96,60)-(156,152),PSET
160 LINE(156,60)-(96,152),PSET
170 LINE(116,90)-(136,90),PSET
180 PAINT(118,91),1,1
190 PAINT(126,152),1,1
200 FOR Q=1TO 3
210 FOR T=1 TO 40
220 P=124+RND(4):Q=110+RND(26)
230 PSET(P,Q,1):FOR L=1TO 50:NEX
T
240 NEXT T:CIRCLE(126,152),15,,.
75,.50,1:PAINT(126,143),1,1
250 NEXT Q:CIRCLE(126,152),19,,.
75,.50,1:PAINT(126,140),1,1
260 FORX=1TO2000:NEXT
```

Sugar Software

Sugar Software





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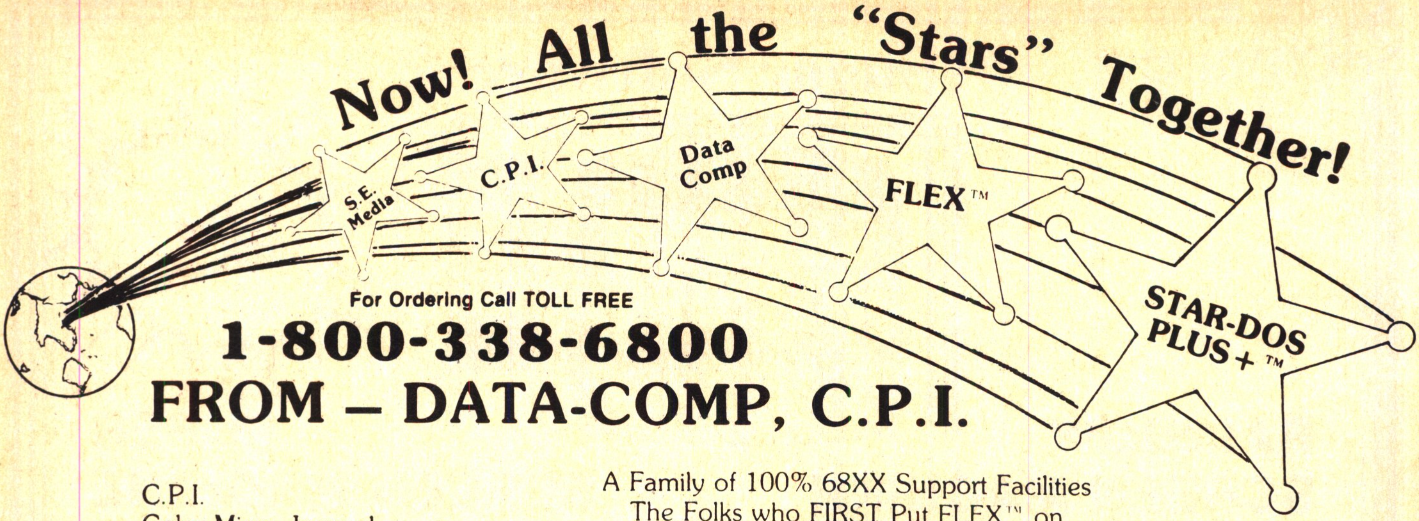

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A Practical Alternative For Creating A Pupil Database

By Michael Plog Ph.D.
Rainbow Contributing Editor

Recently, I had a chance to talk with some school people about using a pupil database. These people were directors of a program operating in schools, and needed to supply information to funding agencies (state education agencies, Federal grant agencies, or even foundations and industries). The funding agencies request information about each student being served with the money provided. Thus, the pupil database is a set of information wherein each student represents one record. Specific data elements may include such things as birth date, grade level, sex, scores on tests, date of entering the program, length of service by program personnel, and so on.

A pupil database is ideally suited for a microcomputer. There is the need to store information, have access to that information for updating, and prepare a report to be delivered to the funding agency. In this article, we will consider some of the features of a pupil database, and some of the uses.

With many commercial databases on the market, there is no need for local programmers to try to write their own database. Local efforts will probably not be as flexible as commercial programs, and will have to go through a long period of debugging. The time required to prepare a complete database program is probably not worth the amount of money required to buy one of several excellent products. I have no idea how many database packages are available for the Color Computer, but I have seen some in operation. With the power available for the low price, it is silly for local people to try to write their own. Thus, it is suggested that school personnel buy a commercial product; one that fits their needs and is easily understood.

When designing the database, and determining what information to store, include more than the minimum required by the funding agency. Consider what will be needed for local school use, in addition to what the outside agency will need. Such things as parents' names, address, telephone number, grades in classes, etc., are of local concern, but generally not of concern to funding agencies. Design the database carefully. Remember, it will be impossible to get anything out of the pupil database that has not been put in.

Getting information out of a database may prove more complex than most people think. To get local reports from a database, the commercial reporting formats may work fine. However, the report to the funding agency may be a different matter, and after all, what is the sense of storing information on a microcomputer if you cannot have the machine prepare the reports for you?

Most funding agencies now use computer printer paper for student reports. After all, they have to enter the information they receive (typically on a mainframe), and simply use what is convenient. The trouble is that most of these forms will not be appropriate for commercial database report formats. Such things as the name of the school district may have to be printed on each page. Line spacing may prove to be a difficulty. Summary calculations may be required. Judging from the student reports I have seen, commercial database report formats are inadequate for the job.

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(Michael Plog received his Ph.D. degree from the University of Illinois. He has taught social studies in high school, worked in a central office of a school district, and currently is employed at the Illinois State Board of Education.)

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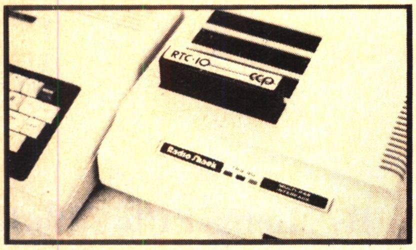

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reports is to write a program to take the data from storage, format it in the required manner, and print it directly to the forms provided by the funding agency. If the records are stored in ASCII format, a BASIC program will solve this problem easily.

But there is the rub. Most program directors would find that hard to do. Few would have the time necessary to write such a program in BASIC. Even if program directors had the time, few have the background in programming. Generally, their training has not included a study of computer languages. Naturally, there will not be a major inclination to learn BASIC just for this purpose.

Hiring professional programmers is expensive. And while I have nothing against people selling their programming skills (I have done so myself), it must be recognized that many schools simply cannot afford the luxury of contracting with a programmer for what may well be a small program affecting only a few students. What is needed is inexpensive programmers. (I refuse to say cheap programmers, because that implies low quality.)

> ***"It seems an entirely workable idea to have students put classroom experiences to use on a real life problem."***

There is a solution which makes this difficulty minor. Why not use students in school taking computer classes? The majority of schools in the country are teaching classes in BASIC. Students in these courses are learning a great deal about programming, and even writing programs that get published in magazines such as THE RAINBOW. The instructors of these courses are right in the buildings with the projects needing assistance from microcomputers. And of course, the price is right.

It seems an entirely workable idea to approach the instructor of a computer course with the idea of having the students put their classroom experiences to use on a real life problem. This would not only help the local district (getting reports in on time), but would give the students a chance to show their creativity, and progress beyond the typical exercises and activities of the classroom. The task would provide an excellent opportunity for the more advanced students in the computer course, but would also be appropriate as a project for the entire class.

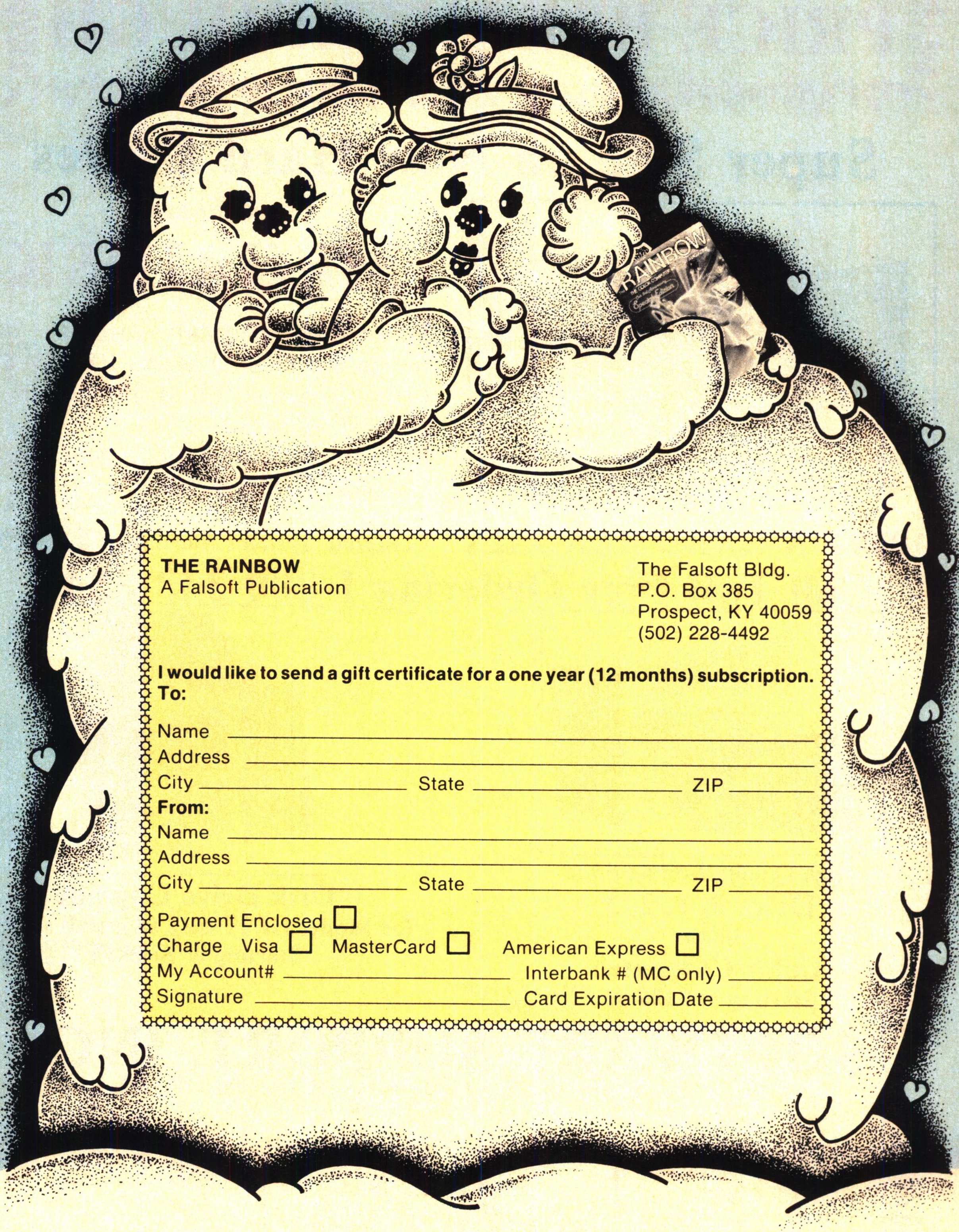
I realize that most readers of this article are not going to be program directors in need of microcomputer assistance. A more likely audience will be instructors of the computer classes. Well, go ahead — take the initiative. If you think your class could accomplish this type of activity, seek out those directors and coordinators of programs that might benefit from such a program. They will not be hard to find. Such folks are involved in things like special education, bilingual, chapter I, vocational programs, or in Federal programs funded directly to schools. Sometimes foundations and large industrial firms will fund special programs in schools.

The point of this suggestion is to advance and expand the use of microcomputers in schools. This is perhaps a non-traditional use of the microcomputer, and certainly a non-traditional use of microcomputer courses. But the cooperation that results cannot be anything but helpful — to students, teachers, program directors, and the school system itself.

Another thought about the database concept needs to be mentioned. The initial data load can be a problem, much more so than simply updating information already stored. Most school systems do not have enough secretarial help to keep up with the daily tasks that have to be done, much less take the time to load a host of student information into a microcomputer. What is needed is an inexpensive source of typing labor. Since we are using inexpensive programmers, why not continue the same idea here. Approach the typing teacher. I would imagine most teachers would appreciate the opportunity to have their students gain experience with a different keyboard, learn something about data entry, and get some practice on an activity that has immediate value.

So, it should be possible to use the microcomputer to further the cause of cooperation in schools, provide services that would not be available otherwise, and broaden the potential uses of modern technology in education. Not a bad deal. If anyone is currently engaged in such an activity, please let me know. If anyone starts something like this, I would appreciate knowing about it. My address is 829 Evergreen, Chatham, IL 62629. Until next month, take care and keep learning.

It'sno job to give the perfect gift for this Christmas.



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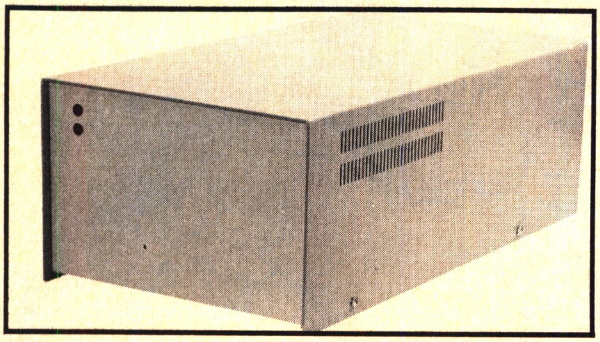

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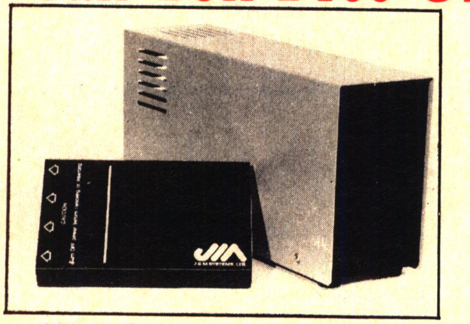

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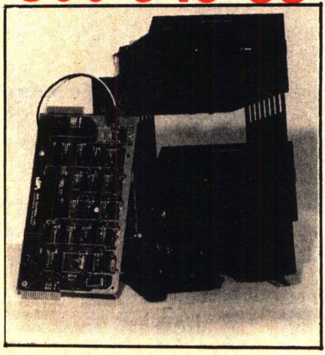

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EXPANDING BASIC 16K DISK the RAINBOW

Cooking With CoCo

Part VII

By Colin J. Stearman

Teaching CoCo how to clean up after its errors and own up to mistakes

Probably the most frustrating limitation of the Microsoft BASIC in CoCo is its lack of ability to trap errors. Even the best written programs generate errors and when they do, it's infuriating to have CoCo tell you how you messed up and then tell you with a condescending smirk that it's OK! It isn't OK, so we must do something about it.

Error Trapping

Most flavors of BASIC have a statement similar to *ON ERROR GOTO nnn* which tells the interpreter that if an error occurs jump to line 'nnn' and continue running. Then at line 'nnn' we can write some lines which handle the error and continue the running of the program.

Because *ON* is already a BASIC keyword I decided to simplify the syntax. So here is a description of the error trapping command and some associated variables.

ERRORS

The syntax for the error directing line is *ERRORS GOTO nnn*, where 'nnn' is an existing line number or zero. When such a line is encountered in your program it simply tells the interpreter that, should an error occur, go to line 'nnn'. This command will stay in effect until another such line is encountered saying go to a different line on an error. Except if 'nnn' is a zero, error trapping is canceled and errors cause BASIC to stop the program and report just as before (or nearly as before, as you will see).

If line 'nnn' does not exist, then a 'No such line number' error will occur if the statement is entered in the direct mode. However, if it is in a program, it will create an error itself, but the error will have nowhere to go, and the program will lock up. Pressing Reset is the only option left.

Because the line number follows a normal *GOTO* statement, the *RENUM*

(Colin J. Stearman is an electronics engineer educated in the U.K. He has worked with all kinds of computers and has been a CoCo enthusiast for over two years.)

command will handle it correctly.

When any error occurs all *FOR . . . NEXT* loops and subroutine return addresses are canceled, allowing the error handling routine to jump to anywhere in the program without a problem.

ECODE

This numeric variable returns the current error code number. If no error has yet been encountered, it will have the value -1, so if a NO SUCH FILE error was the most recent error, then doing a PRINT ECODE would print 26, the code number for that error. ECODE may be used just as any other numeric variable, but it may not be assigned a value by putting it on the left of an equal sign.

ELINE

This is also a numeric variable and all comments about ECODE apply equally to it. This returns the BASIC line number on which the most recent error occurred. If no error has yet occurred this variable will have the value of -1.

ENAME$

This is a string variable which contains the name of the most recent error. If no errors have yet occurred, ENAME$ is a zero length string. All normal string manipulation functions may use it, but it too must not appear on the left of an equal sign.

The error code numbers returned by ECODE and the associated error strings are:

ECODE	ENAME$
0	NEXT without FOR
1	Syntax
2	Return without GOSUB
3	Out of Data
4	Function Call
5	Overflow
6	Out of Memory
7	No such line #
8	Subscript
9	Redimensioned Array
10	Divide by 0
11	Illegal Direct Command
12	Type Mismatch
13	Out of String Space
14	String too long
15	String too complex
16	Can't Continue
17	File Data
18	Already Open
19	Device Number
20	Read/Write
21	File Mode
22	File Not Open
23	Read past End of File
24	Direct Command in File
25	Undefined Function
26	No such File
27	Record #
28	Disk Full
29	Out of Buffer Space
30	Write Protect
31	File Name
32	Directory
33	File Exists
34	Field Overflow
35	Set to Non-Fielded String
36	Verify
37	Access past End of File

If no error trapping is set, BASIC will return these fully spelled out error messages followed by the word ERROR, instead of the cryptic question mark and two letter code.

Due to memory space limitations, ENAME$ and fully spelled out error messages are not included in the patch to *DECB 1.1*.

SWAP

The final BASIC command to be added is SWAP. This has no connection with error trapping but is useful to have around. The syntax is: *SWAP var1,var2* where 'var1' and 'var2' are like variables. This means that SWAP A$,B$ will cause the string associated with A$ to be assigned to B$ and vice versa. Similarly, SWAP DL,WP will cause the value assigned to DL to be assigned to WP and that of WP to be assigned to DL. If the two variables are not of the same type, (string or numeric) then a 'Type Mismatch' will occur.

"When any error occurs all **FOR . . . NEXT** ***loops and subroutine return addresses are canceled, allowing the error handling routine to jump to anywhere in the program without a problem . . . If no error trapping is set, BASIC will return these fully spelled out error messages followed by the word ERROR, instead of the cryptic question mark and two letter code."***

The SWAP command saves the need for an intermediate holding variable when exchanging variable values and is considerably faster than this approach. The obvious application is in 'bubble sorts' where elements must be swapped.

A Final Flourish

If you look at Listing 1 around the label RESET you will notice some additional start-up codes. This executes when CoCo does a cold start. The first thing this code does is restore all the drives to track 0. This eliminates that annoying search up and down the disk during the first disk access. The slight increase in start-up time is worth the subsequent savings in access time and reduction in wear and tear on the drive itself, not to mention your nerves!

This code restores all possible drives to track 0. If you do not have four drives you can improve the start-up time a little by only restoring the drives you do have. This is done by changing the '3' in the line immediately after the line defining RESET (which reads 'LDB #3 NUMBER OF DRIVES') to one less than the number of drives you do have.

Adding This Month's Code

Just as in previous months, pull the assembly file built up so far into your editor, then remove the commenting asterisks from the start of line with [REF #] of 2, 9-1, 9-2 and 9-3. Completely delete reference lines 18, 19, 25, 26 and 27. Also delete all lines at the end starting with 'ZZLAST EQU *-1'.

Now type in the new code found in Listing 1 and reassemble the result. As this month's addition is the last, rename the composite assembly language source as *DISKPTCH.ASM* and the binary file as *DISKPTCH.BIN*. Test the binary patch file just as you have for the past few months.

Wrapping It Up Next Month

The next issue of THE RAINBOW will see the last installment of this series. In it we will tie up a few loose ends; put the entire revised version of Disk BASIC in an EPROM and mount it in the disk controller, and make some suggestions for commands you could add yourself. I hope you'll plan on joining me then.

If you would like the entire *DOSPATCH* program source, along with binary files with and without the parallel port driver for *DECB 1.0* and *DECB 1.1*, just send me a disk (no cassettes please) along with $6 and a stamped, addressed disk mailer. I will load the disk and return it to you promptly.

Address this request or any questions to: Colin Stearman, 143 Ash Street, Hopkinton, MA 01748.

The listing:

```
                     OPT   LIS
              ********************************************
              *  PATCH #4 to RSDOS (C)1984 Colin Stearman *
              ********************************************
              *
              * "BAUD" COMMAND CODE
              * SYNTAX IS BAUD(N) WHERE N =
              * 300,600,1200,2400,4800,9600
              *
DC62 BE       BDCNST FCB   $BE,$57,$29,$12,$6,$1 300,600,1200,2400
              *                         4800,9600 BAUD CONSTANTS
              *
              *
DC68 BDB262   BAUD   JSR   $B262       EVAL BRKT ARGUMENT
DC6B BDB740          JSR   $B740       GET INTEGER IN X
DC6E 6FE2            CLR   ,-S         FOR COUNTER
DC70 1F10            TFR   X,D         GET BAUD VALUE
DC72 10832580        CMPD  #9600       HIGHEST LEGAL VALUE
DC76 1022FBBF        LBHI  FCERR       ERROR IF HIGHER
DC7A 6CE4     CNTBD  INC   ,S          COUNT SUBTRACTION
DC7C 83012C          SUBD  #300        DIVIDE BAUD BY 300
DC7F 102BFBB6        LBMI  FCERR       NOT A VALID VALUE
DC83 26F5            BNE   CNTBD       CONTINUE SUBTRACTION
              * GOT A VALID MULTIPLE OF 300
DC85 3502            PULS  A           GET RESULT
DC87 5F              CLRB              POWER COUNTER
DC88 8EDC62          LDX   #BDCNST     POINT X TO BAUD CONSTANTS
DC8B 44       SFTAGN LSRA              BIT INTO CARRY
DC8C 2503            BCS   GETCON      GOT BIT GET CONSTANT
DC8E 5C              INCB              COUNT SHIFT
DC8F 20FA            BRA   SFTAGN      GO SHIFT AGAIN
DC91 A685     GETCON LDA   B,X         GET BAUD RATE
DC93 9796            STA   BAUDRT      SET BAUD RATE
DC95 0F95            CLR   BDFLAG      CLEAR TO ENABLE SERIAL PORT
              *                     AND SET LSB OF BAUD RATE
              *
DC97 39              RTS               ALL DONE
              ********************************************
              *   "LDIR" COMMAND, PRINT DIRECTORY
              *
DC98 C6FE     LDIR   LDB   #-2         POINT DEVNUM TO PRINTER
DC9A D76F            STB   DEVNUM
DC9C 7ECBCF          JMP   A0016       DO DIR COMMAND
              ********************************************
                     IFDF  PARPRT      ASSEMBLE FOR PARALLEL PORT
              *
              * "PARALLEL" COMMAND CODE AND OUTPUT ROUTINE
DC9F CC01CA   PARA   LDD   #$1CA       120 BAUD DELAY
              *                     SET MSB TO 1 FOR PARALLEL PORT
DCA2 DD95            STD   BDFLAG      TO MAKE PARALLEL ACTIVE
DCA4 39              RTS
              **********
              * Parallel port output routine
              * This is called by the modified jump at $168
DCA5 0D95     PAROUT TST   BDFLAG      IF NOT ZERO THEN PARALLEL
DCA7 1027EE9F        LBEQ  A0015       DO SERIAL OUTPUT
DCAB 3402            PSHS  A           SAVE VALUE
DCAD 966F            LDA   DEVNUM      GOING TO DEVICE -2?
DCAF 81FE            CMPA  #-2
DCB1 3502            PULS  A           RECOVER CHAR, FLAGS DONT CHANGE
DCB3 1026EE93        LBNE  A0015       NOT DOING DEVICE #-2
              *
              * PARALLEL OUTPUT WANTED
DCB7 810D            CMPA  #$0D        WAS IT A CR?
DCB9 2703            BEQ   WASCR
DCBB 0C9C            INC   <$9C        INCREMENT LINE PRINT POSITION
DCBD 8C              FCB   $8C         SKIP NEXT 2 BYTES
DCBE 0F9C     WASCR  CLR   <$9C        LINE COUNTER
DCC0 3411            PSHS  CC,X        PRESERVE BASIC VALUES
DCC2 8EFF26          LDX   #DATA       POINT X TO PIA
DCC5 6D1E     CHKRDY TST   -2,X        BUSY IF LINE 7 HI
DCC7 2BFC            BMI   CHKRDY      WAIT UNTIL LOW
DCC9 A784            STA   ,X          DATA REGISTER
DCCB 3511            PULS  CC,X        RECOVER VALUES
DCCD 3262            LEAS  2,S         OLD RETURN OFF STACK
DCCF 39              RTS               TO ORIGINAL CALLER
              *********
                     ENDC
                     OPT   LIS
              ********************************************
              *  PATCH #5 to RSDOS (C)1984 Colin Stearman *
              ********************************************
              *
              ********************
              *   "SWAP"
              *
              * CODE FOR SWAP COMMAND SYNTAX IS SWAP V1,V2
              * WHERE V1 AND V2 ARE LIKE VARIABLE TYPES
              *
DCD0 BDB357   SWAP   JSR   $B357       GET FIRST STRING POINTER
DCD3 9606            LDA   <6          TYPE 0=NUMBER -1=STRING
DCD5 3412            PSHS  X,A         SAVE ON STACK
DCD7 BDB26D          JSR   $B26D       PARSE REQUIRED COMMA
DCDA BDB357          JSR   $B357       GET 2ND STRING POINTER IN X
              * NOW TEST THAT BOTH VARIABLES ARE SAME TYPE
DCDD 3502            PULS  A           RECOVER FIRST TYPE
DCDF 9106            CMPA  <6          CHECK FOR SAME AS SECOND
              * NOT SAME TYPE SO ISSUE ?TM ERROR
DCE1 1026D46C        LBNE  $B151       TYPE MISMATCH
              * SAME TYPE SO SWAP POINTER INFO
DCE5 3540            PULS  U           ONE IN X, OTHER IN U
DCE7 C605            LDB   #5          COUNTER
DCE9 A684     SWAP5  LDA   ,X          GET VALUE AT X
DCEB 3402            PSHS  A           PRESERVE IT
DCED A6C4            LDA   ,U          GET VALUE AT U
DCEF A780            STA   ,X+         PUT AT X
DCF1 3502            PULS  A           GET ORIGINAL AT X
DCF3 A7C0            STA   ,U+         PUT AT U
DCF5 5A              DECB              REDUCE COUNTER
DCF6 26F1            BNE   SWAP5       CONTINUE SWAPPING
DCF8 39              RTS
              ************************
              *  "ERRORS" Command
              * Executed when the ERRORS command is encountered
              *
DCF9 C681     ERRCMD LDB   #$81        CHECK "GO"
DCFB BDB26F          JSR   $B26F       NOT THEN SYNTAX ERROR
DCFE C6A5            LDB   #$A5        CHECK "TO"
DD00 BDB26F          JSR   $B26F       NOT THEN SYNTAX ERROR
DD03 BDAF67          JSR   $AF67       PROCESS LINE # INTO $2B
DD06 DC2B            LDD   <$2B        GET THE LINE #
```

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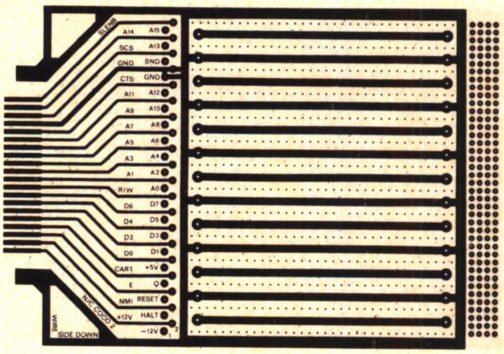
```
DD08 DDDC               STD   JLINE      SAVE IT
                 ** IF ZERO THEN CLEAR TRAPPING
DD0A 2773               BEQ   ERRSET
                 ** CHECK FOR VALID LINE NUMBER
DD0C DCA6               LDD   $A6        GET PARSER POINTER
DD0E 3406               PSHS  D          SAVE ON STACK
DD10 BDAEA9             JSR   $AEA9      CHECK VALID NUMBER
                 *IF WE GOT BACK HERE IT'S OK
DD13 3506               PULS  D          RESET PARSER POINTER
DD15 DDA6               STD   $A6
DD17 39                 RTS
                 ************************
                 *  ERROR TRAPPING AND HANDLING ROUTINE
                 *
                 * this code is executed when an error is
                 * encountered by BASIC from jump at $18F
                 *
DD18 BDD81B      ERRTRP JSR   DIRECT     CURRENT LINE
DD1B 2724               BEQ   NOTRAP     SO DONT TRAP IT
DD1D 9EDC               LDX   JLINE      GET ERRLINE JUMP
DD1F 2720               BEQ   NOTRAP     SO DONT TRAP IT
                 ********
                 * WE WANT TO TRAP ERROR NOW B HAS ERROR CODE *2
                 * IF AN OD ERROR THEN THEN ADDRESS  AT $2B NEEDS
                 * PUTTING AT $A6 BECAUSE READ MOVED IT TO SCAN
                 * THE DATA STATEMENTS
                 *
DD21 C106               CMPB  #$6        OD ERROR NUMBER
DD23 2604               BNE   NOREAD     NOT A OD ERROR
DD25 9E2B               LDX   $2B        GET POINTER
DD27 9FA6               STX   $A6        PUT IT IN PARSER
DD29 54          NOREAD LSRB             DIVIDE BY 2
DD2A D75A               STB   ECODE      CODE ADDRESS
DD2C 9E68               LDX   <$68       CURRENT LINE
DD2E 9F76               STX   ELINE      ERRLINE ADDRESS
DD30 9EDC               LDX   JLINE      GET ERROR GOTO LINE #
DD32 9F2B               STX   <$2B       PREPARE TO GO TO IT
DD34 10DE21             LDS   <$21       CLEAN STACK
DD37 CCADC4             LDD   #$ADC4     RETURN TO INTERPRET LOOP
DD3A 3406               PSHS  D          PUT ONTO STACK
DD3C 0F6F               CLR   DEVNUM     RESET DEVICE CODE
DD3E 7EAEA9             JMP   $AEA9      GO TO NEW LINE
                 ****
                 *PROCESS NO TRAP
DD41 8D3C        NOTRAP BSR   ERRSET     RESET ERROR CODE
                 *
                        IFGT  REV         <----
                        JMP   $AC49        | DOS 1.1 only
                        ENDC              <----
                 *
0000                    IFEQ  REV         <----
                 * Process new error display   |
DD43 BDD1E5             JSR   A0026      CLEAR DISK SYSTEM   |
DD46 3404               PSHS  B          PRESERVE ERROR CODE   |
DD48 BDCA3B             JSR   A0014      MORE DISK SHUTDOWN   |
DD4B 3504               PULS  B          GET ERROR CODE BACK   |
DD4D BDA7E9             JSR   $A7E9      MOTOR OFF   |
DD50 BDAD33             JSR   $AD33      RESET STACK ETC.   |
DD53 0F6F               CLR   DEVNUM     REST TO SCREEN   |
DD55 BDB95C             JSR   $B95C      OUT RETURN IF NEEDED   |
DD58 54                 LSRB             DIVIDE ERROR CODE BY 2   |
DD59 8D06               BSR   ERFIND     FIND ERROR MESSAGE   |
                 * OUTPUT NEW ERROR MESSAGE   |
DD5B BDB9A2             JSR   STROUT     OUTPUT IT   |
DD5E 7EAC65             JMP   $AC65      PRINT " ERROR" ETC.   |  DOS 1.0 only
                 *******   |
                 * error message finder   |
                 * B has error count/2 coming in   |
                 * HAS CHARACTER COUNT COMING OUT   |
                 * X HAS POINTER TO FIRST CHAR   |
DD61 1F98        ERFIND TFR   B,A        MOVE ERROR CODE TO A   |
DD63 8EDDC5             LDX   #ERR0      POINT X TO MSG #0   |
DD66 5F                 CLRB             DONT  AFFECT X FIRST TIME   |
DD67 3A          KPLOOK ABX              ADD COUNT TO ERROR ADDRESS   |
DD68 E680               LDB   ,X+        GET CHARS IN MESSAGE   |
DD6A 4A                 DECA             DECREASE ERROR COUNT   |
DD6B 2AFA               BPL   KPLOOK     KEEP LOOKING   |
DD6D 39                 RTS                 |
                        ENDC              <----
                 *********************************
                 * CLEAR ERROR TRAPPING ON RUN
DD6E 8D0F        ERCNCL BSR   ERRSET
DD70 7EC990             JMP   A0013
                 *********************************
                 * THIS CODE RUNS ON A COLD START AND RESETS ALL
                 * DRIVES TO TRACK ZERO AND RESETS ERROR TRAPPING
                 *
                 * Reset drive 0-1 to track zero
DD73 0FEA        RESET  CLR   $EA        RESTORE OPCODE =0
DD75 C601               LDB   #1         NUMBER OF DRIVES-1
DD77 D7EB               STB   $EB        DRIVE NUMBER
DD79 8D14        NXTDRV BSR   HOME       DO RESTORE TO TRACK 0 WITH 1 RETRY
DD7B 0AEB               DEC   $EB        NEXT DRIVE
DD7D 2AFA               BPL   NXTDRV
                 *
                 *
                 * Clears ERROR trapping
                 *
DD7F 3416        ERRSET PSHS  D,X        SAVE REGS
DD81 9E8A               LDX   ZERO
DD83 9FDC               STX   JLINE
DD85 CCFFFF             LDD   #$FFFF
DD88 DD76               STD   ELINE
DD8A 975A               STA   ECODE
DD8C 3516               PULS  D,X        RECOVER REGS
DD8E 39                 RTS
                 ********
                 * restore drive head with no retries
DD8F 3476        HOME   PSHS  A,B,X,Y,U
DD91 8601               LDA   #1         RETRY COUNT 1= NO RETRIES
DD93 7ED670             JMP   A0032      RESTORE CODE ENDS WITH AN RTS
                 ********************************************
                 *
                 *       "ELINE"
                 *
DD96 DC76        ERRLIN LDD   ELINE
DD98 1083FFFF           CMPD  #$FFFF     IF $FFFF NOT SET?
DD9C 1026FEBD           LBNE  UNSIGN     YES IT IS
DDA0 7EB4F4      SIGNED JMP   $B4F4      RETURN AS SIGNED VALUE (-1)
                 ***********************
                 *
```

6809 SYSTEM DEVELOPMENT



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Precision molded plastic insert designed specifically to align and support printed circuit cards in the CoCo cartridge slot; an unbreakable removable card guide. Patent Pending.

$3.95 each

Available now from:

ROBOTIC MICROSYSTEMS

BOX 30807 SEATTLE, WA 98103

```
                 1329 *       "ECODE"
                 1330 *
DDA3 4F          1331 ERRCOD CLRA
DDA4 D65A        1332        LDB   ECODE
                 1333 *IF MINUS THEN IT IS -1 AND THEREFORE UNSET
DDA6 102AFEB3    1334        LBPL  UNSIGN      OUTPUT UNSIGNED # TO VARIABLE
DDAA 1D          1335        SEX               MAKE D HAVE VALUE IN B
DDAB 20F3        1336        BRA   SIGNED      OUTPUT TO VARIABLE(-1)
                 1337 **************************
0000             1338        IFEQ  REV          <----
                 1339 *       ENAME$   |
DDAD D65A        1340 ERNAME LDB   ECODE       GET ERROR CODE   |
DDAF 2A02        1341        BPL   GETNM       GET ERROR NAME STRING   |
DDB1 5F          1342        CLRB              FOR NULL STRING LENGTH   |
DDB2 A1          1343        FCB   $A1         SKIP NEXT INSTRUCTION   |
                 1344 *   |
DDB3 BDDD61      1345 GETNM  JSR   ERFIND      RETURNS X AT ERROR NAME   |
                 1346 *                  B WITH COUNT   |
DDB6 1F13        1347        TFR   X,U         SAVE ERROR STRING POINTER   |
DDB8 BDB50F      1348        JSR   $B50F       CHECK FOR AVAILABLE SPACE   |
                 1349 *X NOW HAS STRING START ADDRESS   |
DDBB 2705        1350        BEQ   STREXT      NULL LENGTH STRING   |
DDBD 1E13        1351        EXG   X,U         SWAP THE POINTERS   |
DDBF BDA59A      1352        JSR   $A59A       MOVE STRING   |
DDC2 7EB69B      1353 STREXT JMP   $B69B       RETURN VIA STRING$ CODE   |
                 1354 *******************************************   |
                 1355 *   |
                 1356 * ERROR MESSAGES   |
                 1357 *   |
                 1358 * FORMAT IS CHARACTER COUNT/CHARACTERS   |
                 1359 *   |
DDC5 10          1360 ERR0   FCB   ERR1-(*+1)   |
DDC6 4E          1361        FCC   /NEXT WITHOUT FOR/   |
DDD6 06          1362 ERR1   FCB   ERR2-(*+1)   |
DDD7 53          1363        FCC   /SYNTAX/   |
BDDD 14          1364 ERR2   FCB   ERR3-(*+1)   |
DDDE 52          1365        FCC   /RETURN WITHOUT GOSUB/   |
DDF2 0B          1366 ERR3   FCB   ERR4-(*+1)   |
DDF3 4F          1367        FCC   /OUT OF DATA/   |
```

RAINBOW SCREEN MACHINE

The Rolls Royce of graphics text screen enhance 5-more features than all others combined.
Tape $29.95: Disk $32.95

SUPER SCREEN MACHINE

Revolutionary — Heralded as the most useful, powerful and versatile state-of-the-art utility ever developed for the Color Computer.
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Rotate graphic image about on any **Z** axis • slide position graphic with wrap around • copy/enlarge with user-defined shapes • pan and zoom — "blow-up" or "zoom in" on image • font editor — create font styles or char sets • special effects —tunnel vision, fish eye etc • pixel blaster —widen lines color separation.
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GRAPHCOM/Video Digitizer
only $199.95

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4. Payroll	$79.95	8. Master 1-7	$299.95

We carry DFS forms to run with our software. These forms are compatible with over 385 software companies.

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P.O. Box 573
Franklin, KY 42134

Send 3.00 for shipping and handling for free catalog and product information.

Postage paid on all orders. To receive **Free** catalogue & product information send $3.00 to cover shipping & handling.

```
DDFE 0D          1368 ERR4   FCB   ERR5-(*+1)   |
DDFF 46          1369        FCC   /FUNCTION CALL/   |
DE0C 08          1370 ERR5   FCB   ERR6-(*+1)   |
DE0D 4F          1371        FCC   /OVERFLOW/   |
DE15 0D          1372 ERR6   FCB   ERR7-(*+1)   |
DE16 4F          1373        FCC   /OUT OF MEMORY/   |
DE23 0E          1374 ERR7   FCB   ERR8-(*+1)   |
DE24 4E          1375        FCC   /NO SUCH LINE #/   |
DE32 09          1376 ERR8   FCB   ERR9-(*+1)   |
DE33 53          1377        FCC   /SUBSCRIPT/   |
DE3C 13          1378 ERR9   FCB   ERR10-(*+1)   |
DE3D 52          1379        FCC   /REDIMENSIONED ARRAY/   |
DE50 0B          1380 ERR10  FCB   ERR11-(*+1)   |
DE51 44          1381        FCC   /DIVIDE BY 0/   |
DE5C 16          1382 ERR11  FCB   ERR12-(*+1)   |
DE5D 49          1383        FCC   /ILLEGAL DIRECT COMMAND/   |
DE73 0D          1384 ERR12  FCB   ERR13-(*+1)   |
DE74 54          1385        FCC   /TYPE MISMATCH/   |
DE81 13          1386 ERR13  FCB   ERR14-(*+1)   |
DE82 4F          1387        FCC   /OUT OF STRING SPACE/   |
DE95 0F          1388 ERR14  FCB   ERR15-(*+1)   |
DE96 53          1389        FCC   /STRING TOO LONG/   |
DEA5 12          1390 ERR15  FCB   ERR16-(*+1)   |
DEA6 53          1391        FCC   /STRING TOO COMPLEX/   |
DEB8 0E          1392 ERR16  FCB   ERR17-(*+1)   |
DEB9 43          1393        FCC   /CAN'T CONTINUE/   |
DEC7 09          1394 ERR17  FCB   ERR18-(*+1)   |    DOS 1.0 only
DEC8 46          1395        FCC   /FILE DATA/   |
DED1 0C          1396 ERR18  FCB   ERR19-(*+1)   |
DED2 41          1397        FCC   /ALREADY OPEN/   |
DEDE 0D          1398 ERR19  FCB   ERR20-(*+1)   |
DEDF 44          1399        FCC   /DEVICE NUMBER/   |
DEEC 0A          1400 ERR20  FCB   ERR21-(*+1)   |
DEED 52          1401        FCC   %READ/WRITE%   |
DEF7 09          1402 ERR21  FCB   ERR22-(*+1)   |
DEF8 46          1403        FCC   /FILE MODE/   |
DF01 0D          1404 ERR22  FCB   ERR23-(*+1)   |
DF02 46          1405        FCC   /FILE NOT OPEN/   |
DF0F 15          1406 ERR23  FCB   ERR24-(*+1)   |
DF10 52          1407        FCC   /READ PAST END OF FILE/   |
DF25 16          1408 ERR24  FCB   ERR25-(*+1)   |
DF26 44          1409        FCC   /DIRECT COMMAND IN FILE/   |
DF3C 12          1410 ERR25  FCB   ERR26-(*+1)   |
DF3D 55          1411        FCC   /UNDEFINED FUNCTION/   |
DF4F 0C          1412 ERR26  FCB   ERR27-(*+1)   |
DF50 4E          1413        FCC   /NO SUCH FILE/   |
DF5C 08          1414 ERR27  FCB   ERR28-(*+1)   |
DF5D 52          1415        FCC   /RECORD #/   |
DF65 09          1416 ERR28  FCB   ERR29-(*+1)   |
DF66 44          1417        FCC   /DISK FULL/   |
DF6F 13          1418 ERR29  FCB   ERR30-(*+1)   |
DF70 4F          1419        FCC   /OUT OF BUFFER SPACE/   |
DF83 0D          1420 ERR30  FCB   ERR31-(*+1)   |
DF84 57          1421        FCC   /WRITE PROTECT/   |
DF91 09          1422 ERR31  FCB   ERR32-(*+1)   |
DF92 46          1423        FCC   /FILE NAME/   |
DF9B 09          1424 ERR32  FCB   ERR33-(*+1)   |
DF9C 44          1425        FCC   /DIRECTORY/   |
DFA5 0B          1426 ERR33  FCB   ERR34-(*+1)   |
DFA6 46          1427        FCC   /FILE EXISTS/   |
DFB1 0E          1428 ERR34  FCB   ERR35-(*+1)   |
DFB2 46          1429        FCC   /FIELD OVERFLOW/   |
DFC0 19          1430 ERR35  FCB   ERR36-(*+1)   |
DFC1 53          1431        FCC   /SET TO NON-FIELDED STRING/   |
DFDA 06          1432 ERR36  FCB   ERR37-(*+1)   |
DFDB 56          1433        FCC   /VERIFY/   |
DFE1 17          1434 ERR37  FCB   ENDERR-(*+1)   |
DFE2 41          1435        FCC   /ACCESS PAST END OF FILE/   |
DFF9             1436 ENDERR EQU   *               |
                 1437        ENDC                <----
                 1438
                 1439
DFF8             1440 ZZLAST EQU   *-1          last used address value
                 1441 *
                 1442 * ZZLAST must not be greater than $DFFF for
                 1443 * DOS 1.0 and $DEFF for DOS 1.1.   The latter
                 1444 * has the OS-9 Boot program and SWI set routines
                 1445 * from $DF00 to $DF4C
                 1446 *
                 1447 *
                 1456        OPT   LIS
D994             1457        END   ADDCOM
```

NEW!

'HOME COMMANDER' $49.95

BSR CONTROL MEETS THE CoCo

CONTROL YOUR WORLD

Give yourself piece of mind while on vacation by programming the HOME COMMANDER to control lamps, radios, TVs and more. Or make life easy on yourself by turning on the coffee pot before you wake up. You can do this and more with the HOME COMMANDER.

HOME COMMANDER

NO WIRES NECESSARY

The HOME COMMANDER uses your home's existing electrical wiring to control virtually anything. Appliances are controlled via small control modules (sold separately). The LAMP DIMMER MODULE allows you to turn a lamp on or off and control 16 brightness levels. The APPLIANCE MODULE is used to control appliances up to 400 watts such as a TV, radio, stereo system, fan or motor.

ON FRIDAY 7:42 PM, OFF SUNDAY 1:26 AM

Included FREE is a program to allow you to control up to 256 devices and specify the time and date they are to be activated. That's right, the software has its own built in accurate clock.

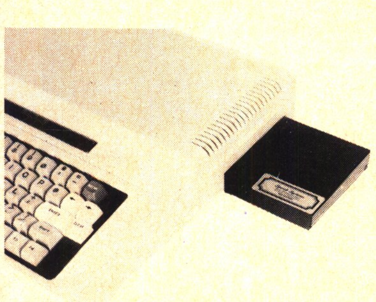
LAMP DIMMER MODULE **$16.95** APPLIANCE MODULE **$16.95**

NEW!

PRECISION TIME MODULE

~~$59.95~~ $49.95 INTRODUCTORY PRICE ENDS FEB. 15

FREE TALKING CLOCK PROGRAM requires VOICE, SUPER VOICE, or SPEECH & SOUND PAK



Now your computer will always know the correct time and date. This amazing precision time module is calibrated to the National Bureau of Standards (WWV) atomic clock and you should never have to change it.

Use the PRECISION TIME MODULE to add the time element to your game. Or use on your BBS so that the time will always be perfectly accurate.

BATTERY BACKUP

Even when your computer is off, the clock keeps correct time by operating using the internal battery backup system.

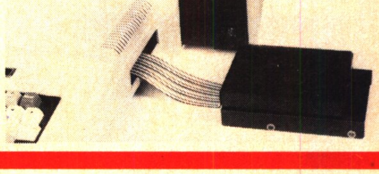
MONTHS, LEAP YEARS & DST

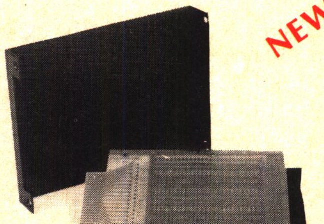
The PRECISON TIME MODULE automatically adjusts for the different number of days in each month as well as leap years. And believe it or not, it adjusts for DST so you don't have to remember if it's SPRING FORWARD or FALL FORWARD.

LOWEST PRICE ANYWHERE

Y-CABLE $28.95

Why pay $100 to $200 for a multi-pak. With the Y-CABLE, you can connect your disk system to your computer along with either our STEREO PAK music synthesizer, our VOICE, SUPER VOICE speech synthesizers, or our PRECISION TIME MODULE. All connectors gold plated.





NEW!

ATTENTION EXPERIMENTERS!

Interested in building your own project? Our oversized board gives plenty of room for construction while the sturdy aluminum case with black satin finish assures protection and a professional appearance.

Prototype Board only **$19.95**
Prototype Enclosure only **$19.95**
Buy both for **$29.95**

Advanced Speech Chip
SSI-263
(SC-02)
$34.95

Need an SC-01? **$29.00**

Disks (any quantity)	$1.49
Tape C-10, C-20	$0.69
Hard Tape Box	$0.29
6821	$2.95
74LS138	$0.79
7407	$0.79
IC sockets 14, 16, 22 pin	$0.29
IC sockets 24, 28, 40	$0.39

FREE BLANK DISK OR TAPE WITH EVERY ORDER

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Dealer Inquiries Invited

We accept CASH, CHECK, COD, VISA and MASTER CARD orders.

Shipping and handling US and Canada	$3.00
Shipping and handling outside the US and Canada	$5.00
COD charge	$2.00

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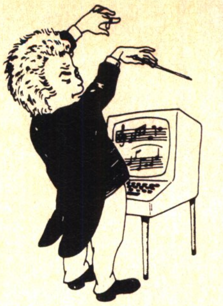
NEW!

MUSICA 2



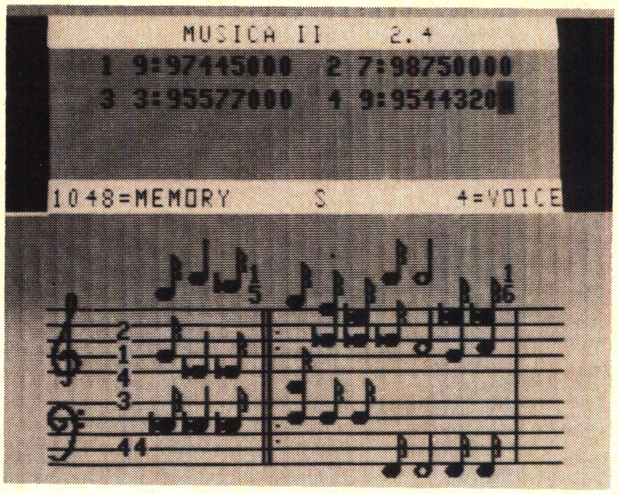
~~Tape $34.95~~
~~Disk $39.95~~

Offer ends
Jan. 15

$29.95
Tape or Disk

- High resolution graphic display, looks just like sheet music.
- Loudness of each voice may be individually specified.
- Memory available is constantly displayed.
- Voice waveshapes may be exchanged between voices at any point.
- Tempo may be specified and may even be altered as the music plays.
- Flats and sharps supported.
- Billions of timbre combinations.

- When in stereo mode, music is played through our STEREO PAK (purchased separately).

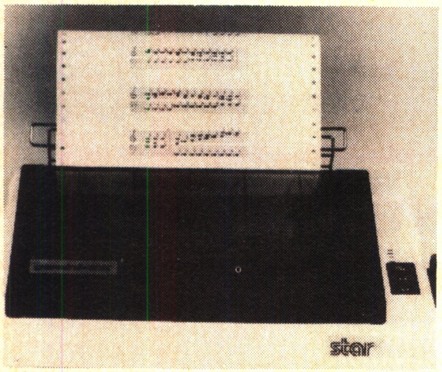


```
        MUSICA II      2.4
 1 9:97445000   2 7:98750000
 3 3:95577000   4 9:9544320
1048=MEMORY       S       4=VOICE
```

- Repeat bars allow repeating of music without re-inserting music a second or third time.

- Voice timbre (waveshape) may be altered by specifying harmonic content just like stops on an organ.
- During editing, voice being inserted is displayed.
- Each measure is numbered for easy reading of music.
- Measure bars aid in reading and developing music.
- Each voice may be visually highlighted for easy identification.

GREAT MUSIC TEACHER



Output your music to any dot matrix printer (Gemini 10X, Epson, R.S. printers, Okidata, etc.)

"Musica 2 is GREAT!"
Stephen Wilson

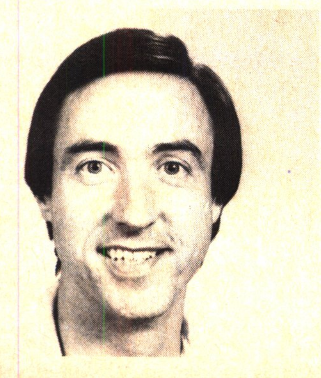
"It's the best four part harmony composer on the market and the most used program in may files."
R.G. Wrights

"Of all the music programs, and I've had them all, there is no comparison in flexibility, simplicity of operation and in the warm vibrant tones that it produces. I went out and spent $700.00 on stereo equipment just so I could more thoroughly enjoy Musica 2 and the Stereo Pak!"
Howard Lentz
TCI Industries

Download music from our BBS or Compuserve

THERE'S MORE

- 4 Voices produced simultaneously
- Input notes from keyboard or joystick
- Play music from your own BASIC program
- Block copy music for easy music development
- 100% machine language so it is lightning fast
- Vibrato effect easily produced
- With STEREO PAK, voices may be switched between left and right speakers as music plays
- MUSICA 2 is 100% software, no need for hardware unless you want music produced in STEREO. In that case, the STEREO PAK may be purchased separately. It's a must for the audiophile!
- Durations include: whole, half, quarter, eighth, sixteenth, thirty second, sixty-fourth, and triplet.
- 30 page manual describes all.



'I THOUGHT ONLY AN APPLE SOUNDED THAT GOOD'

That's what I was told after I gave a seminar and demonstration of MUSICA 2 and the STEREO PAK at the Chicago Rainbowfest. I smiled and thanked the young man for the "supposed" compliment, but upon reflection, I became angered by the apparent belief that the CoCo is inferior in this regard. Nothing could be further from the truth.

To help fight this false belief, we've decided to lower the price of MUSICA 2 to help spread the word.

We will also keep the STEREO PAK price at $39.95 and give you a complete refund if you are not 100% satisfied with the STEREO PAK.

NEW!

STEREO PAK™

Plug this gem into your computer, connect to your home stereo system and sit back and enjoy music realism. The STEREO PAK is a hardware music synthesizer that plays our MUSIC LIBRARY and MUSICA 2 music in stereo. Because it was designed specifically with music reproduction in mind, the sound is superb. The highs are crisp and clear while the bass notes will rattle your walls.

The STEREO PAK is all hardware. It is intended as an enhancement for MUSICA 2 and our MUSIC LIBRARY. Disk owners may use the STEREO PAK with the R.S. Multi-Pak or our Y-CABLE ($28.95)

~~$49.95~~
39^{95}
INTRODUCTORY
PRICE

NEW!

MUSIC LIBRARY™ — 3 VOLUMES

BUY 2
GET 3rd
FREE

You get over 100 four voice songs with a combined playing time of 3 hours. That's right, 3 hours of music. You won't belive your CoCo could sound so good. To fit over 100 songs required both sides of 5 C-20 tapes and the disk version uses 5 full disks (that's a half box of disks).

A JUKE BOX selection program is included to allow you to select specific songs or automatically play each. These songs are ready to go, you don't need MUSICA 2 or a knowledge of music.

These songs were developed using the best music program available for the CoCo; MUSICA 2. The tunes may be used as source files for MUSICA 2 and changed by the user. When coupled with the STEREO PAK the songs are reproduced in stereo with unsurpassed realism.

MUSIC LIBRARY 100 categories:

- Stage, Screen, and TV
- Music of the 70's
- Music of the 60's
- Music of the 50's
- Old Time Favorites
- Classical
- Christmas (popular)
- Christmas (traditional)
- Patriotic
- Polka Party

MUSIC LIBRARY 200
Our second volume of 100 tunes, 3½ hours of music.

MUSIC LIBRARY 300
Our third volume of 100 tunes, 3 more hours of music.

MUSIC LIBRARY (Each Volume) . . (32K Tape) . . . **$34.95**
(Specify 100, 200, or 300) (32K Disk) **$39.95**

FREE
SOFTWARE

NEW!

SPEECH SYSTEMS DATAPEN

only . . . $29.95

HIGHEST
QUALITY

Two programs are provided free with each DATAPEN. SKETCH is a superb high resolution color drawing program allowing precise drawing and freehand sketching, painting and much more. SHAPE CREATE is a high resolution library shape drawing program. You can even save your work to tape or disk for later display or editing.

The software is shipped on tape and may easily be moved to disk. Included is complete documentation to allow you to integrate the DATAPEN into your own BASIC program.

EASY TO USE!

The DATAPEN is a lightpen, but unlike other light pens, it is far more sophisitcated.

- Insensitive to ambient light.
- Responds to different colors
- Program accessible LED lamp readout
- Switch for program control

WE STAND BEHIND OUR PRODUCTS

Like all our other products, if it is not the best, we won't sell it. If you're not 100% satisfied, merely return the DATAPEN for a complete refund.

FREE
BLANK DISK
OR TAPE
WITH EVERY
ORDER

VISA® MasterCard

Dealer Inquiries
Invited

We accept CASH, CHECK, COD, VISA and MASTER CARD orders.

Shipping and handling US and Canada	$3.00
Shipping and handling outside the US and Canada	$5.00
COD charge	$2.00

Illinois residents add 6¼% sales tax

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CALL ANY DAY, ANYTIME TO ORDER. ALSO ORDER BY MAIL OR BBS.

'TALKING SOFTWARE'

FOR THE VOICE, SUPER VOICE ™, RS SPEECH & SOUND PAK

RADIO SHACK®
SPEECH & SOUND TRANSLATOR

FREE
When you buy
any 5 of our
Talking Programs

We believe that no COCO speech synthesizer gives you the power and flexibility of the SUPER VOICE. Nevertheless, some have decided to go with the Radio Shack SPEECH & SOUND PAK. For those we've decided to open our TALKING LIBRARY by offering the SPEECH & SOUND TRANSLATOR . Just load this program and our entire library is open to you.

But that's not all, this program adds features. You get increased intelligibility, the power of an exception table to specify specific pronunciations, $12.81 is spoken in dollars and cents, 1,234,567 is spoken in millions, thousands, and hundreds, and much more. **$24.95**

TERMTALK All the features of an intelligent telecommunications program plus what appears on the TV is spoken.

- Upload and Download programs
- Full or Split Screen
- Normal or Reverse Video
- Control Xmit Protocols
- Buffer Editing
- It talks

Please specify version (VOICE or RS SPEECH & SOUND PAK)
Tape **$39.95** Disk **$49.95**

TALKING BINGO BINGO was never like this. The VOICE or SUPER VOICE makes all the calls while you sit back and play. Comes with 20 playing cards and 200 markers. High Resolution graphic screen, 3 timing level, ball count and pause control. **$24.95**

ESTHER the talking psychoanalyst. An excellent example of artificial intelligence. She may not solve all your problems, but her insight will amaze you. Just like the original Eliza. **$24.95**

SCORE E-Z A yahtzee type game. Up to six can play. **$24.95**

ADVENTURES

CULT OF THE CAVE BEAR You're a stranded time traveler 50,000 years in the past. Can you fix your time machine while still surviving in this alien environ, and make it back? **$29.95**

SHIP HUNT Play Battleship with your CoCo. All status reports are spoken. Ready battery, aim, fire at will! **$24.95**

FINAL COUNTDOWN You must stop the mad general from launching a missile at Moscow and causing WW III. Has multiple voices for added realism. **$24.95**

STAR TALK You're the Star Fleet Captain. Your mission...destroy the enemies' Dragon Star Ships. All status reports are spoken! **$24.95**

ADVENTURE GENERATOR Create talking adventure games that are 100% Machine Language. Up to 99 rooms, 255 objects, 70 command words and 255 conditional flags. 64K Disk **$39.95**

EDUCATION

CONTEST
WINNER

ANIMATED SENTENCES The child builds complete sentences from a graphic menu using keyboard or joystick. The action is then spoken and acted out graphically. It's a great way to learn the parts of speech (ie. verb, subject, noun, etc.) **$24.95**

Congradulations
Glenn
Chamberlin

PRE-SCHOOL

TALKING COUNT TO ONE HUNDRED A program designed to teach the child counting to 100 by 1, 2, 5, and 10 forwards and backwards. **$29.95**

TALKING ALPHABET A program designed to help the pre-schooler master the alphabet. **$29.95**

TALKING NUMBERS & COLORS A must program for the very young. High Resolution graphics to insure attention and concentration. **$29.95**

TALKING NUMBER SKILLS The child becomes familiar with the shape and meaning of numbers. **$29.95**

TALKING CLOCK In these days of the digital clock, children miss an important education. This program aids the student in mastering the traditional analog clock. High Resolution graphics. **$29.95**

GRADES 2 - 6

TALKING SUBTRACTION A program specifically designed to help the student learn subtraction. **$29.95**

KING AUTHOR'S TALES A creative writing tool to allow a child to write compositions, or short stories. Q & A option is also included. **$29.95**

COLOR MATH Addition, Subtraction, Multiplication, and Division are mastered. Student may specify difficulty level. **$24.95**

SPELL-A-TRON Student builds a dictionary of words to be quizzed on. Perfect for Spelling B. **$24.95**

SPELLING TESTER A graphic spelling game. The student is shown objects to be spelled. **$9.95**

POETRY CREATOR The VOICE speech unit is used to speak poetry that is created. **$9.95**

SHORT STORY MAKER A program to create and speak stories created by the child. **$9.95**

FOREIGN LANGUAGE Learn a foreign language. French dictionary is included. **$9.95**

PRESIDENTS The student is able to master the Presidents of the US. **$9.95**

STATES A program designed to aid the student in learning correct spelling of the states. **$9.95**

CAPITALS Learning the State's Capitals is made more interesting using speech. **$9.95**

HANGMAN A word guessing game. You must guess the word before you hang. **$9.95**

MATH DRILL A program to help teach arithmetic. **$9.95**

All software, except as noted, shipped on tape but may be moved to disk.

'SUPER VOICE'

T.M.

SUPER VOICE

COCO'S MOST ADVANCED SPEECH SYNTHESIZER.

NOW IT TALKS, SINGS AND MORE.

only . . . $79.95

In 1979, VOTRAX brought us the SC-01 chip which made inexpensive speech synthesis possible. Speech Systems was proud to bring the COCO community the first speech synthesizer using this miracle device.

Now Silicon Systems Inc. brings us the SSI 263 (sometimes called the SC-02). Once again Speech Systems is happy to be the first to bring you this breakthrough in speech synthesis. The SSI 263 is the most advanced speech chip available. Read "Build a Third Generation Phonetic Speech Synthesizer" in the July 84 issue of BYTE magazine for details of this amazing chip.

The SUPER VOICE gives you COCO's most intelligible speech. In addition, the free TRANSLATOR text-to-speech program allows you to easily write your own BASIC programs. Highest quality speech may be achieved by specifying inflection, intonation, articulation, and filtration. But that's not all, the SUPER VOICE can actually sing over a 6 octave range. And while the SUPER VOICE was intended for speech synthesis, the fact that you can specify complex speech parameters means you can even create sound effects.

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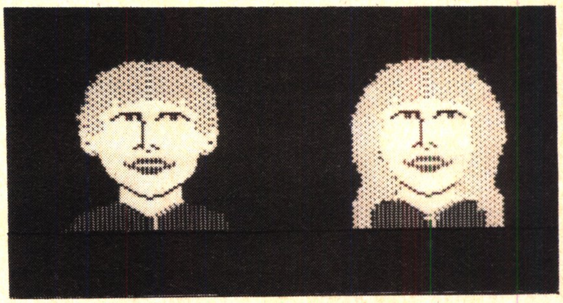

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ONLY $99.95

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Rom-Pak model has gold contacts for more reliable operation.
Comprehensive, easy to follow manual
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Copy memory from one location to another
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Defeats All auto-start programs,
Rom-Pak design allows use of disk system while Master Key is installed.
Works with all versions of CoCo, 16K+

The MASTER KEY may be used to convert many programs from tape to disk, and yet does not require a background in assembly language. Using the METHODS section of the manual will allow even a novice to copy many programs. As you learn more about assembly language, you'll be able to use the MASTER KEY's full capabilities.

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30 DAY MONEY BACK GUARANTEE: If you find any program that MASTER KEY cannot take control of, simply return for a full refund.

NOTICE: The MASTER KEY has been developed as an educational tool and to allow the user to examine and save for archival purposes programs he/she has purchased.

NOTE: "F" board owners must cut a capacitor - details included.

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Fastape gives you cassette I/O at 3000 baud-Twice Normal Speed. It uses the high-speed (POKE 65495,0) mode, and makes it convenient to stay in this mode throughout. Features automatic adjustment of cassette and printer parameters when speed mode is changed. Control-key functions for many Basic commands and for changing speed modes. Compatible with all tape file types. Can be used with Telewriter-64 and many other utilities.

"I strongly recommend this fine utility" Rainbow, 7/83
"A treat for those without disk systems" Hot Coco, 10/83

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For fun, (and this requires no ML experience), use Peeper with arcade games, watching the fine details of the animation effects in slow motion. See how the game looks and plays in other graphics modes. Or watch what is happening on "hidden screens" you never see. (Makes a superb demonstration.)

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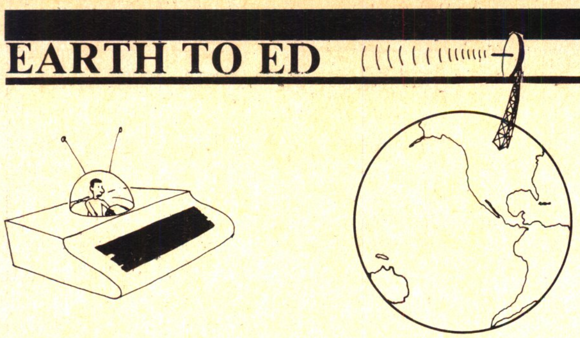


High Fidelity Hardware Hacking

By Ed Ellers
Rainbow Technical Writer

- *Is there any way to get parallel data in and out of a CoCo? I would like to store data using an eight-track tape recorder at a higher speed than my single track serial data recorder. Would I need more than eight tracks?*

Is it possible to change the Baud rate of data to and from the cassette recorder like you can to the printer? I use a Pioneer reel-to-reel tape deck, which I'm sure can handle a faster Baud rate.

David DeGomez
Denver, CO

The idea of using an eight-track recorder to store data has been tried before, but not in the way you describe. It sounds like you're talking about recording eight tracks simultaneously; that is not what the conventional eight-track tape decks do, and would require a special recording head. As for faster cassette I/O, you might try this if your computer will accept the speed-up poke:

```
POKE 65497,0:CSAVE"filename"
  :POKE 65496,0
```

This should *CSAVE* a program at 3000 Baud instead of 1500, though I make no promises. The reason that I have the two *POKEs* in a single command line is that *POKEing 65497* disrupts a number of normal CoCo functions (including video); this method does the *POKE,* saves the file and then puts the machine back at normal speed. The same procedure (with *CLOAD* in the middle) would be used to load such a file. You shouldn't need to move up to a different recorder to do this.

Frozen Contacts

- *I have a General Electric cassette recorder for my CoCo, and all of a sudden the recorder won't stop when it's done loading or recording a program. A friend said that my computer is not turning the recorder off and it is stuck in the "on" position. Is there any way to fix this without opening up the computer?*

D. Milsom
Newark, DE

I don't see how. The problem is probably in the relay inside the CoCo that controls the cassette motor; it may have become spot-welded in the closed position from excessive current and the resulting sparks. Early models of the CoCo (C, D and E boards) had a rather small relay; newer machines had a better one that clicks rather loudly. I'd have to say your recorder probably contributed to the problem. Radio Shack recorders are wired so that the remote jack switches only the motor; most other makes (including GE, as far as I know) switch all power within the recorder, which means that the relay has to carry more current than Radio Shack allowed for when they picked that relay for the CoCo. To make absolutely sure that the CoCo is at fault before trying a repair, unplug the remote plug from the recorder and connect an ohmmeter across the plug contacts. The remote circuit should read "open" unless you have the computer in a cassette I/O function (or you have selected *AUDIO ON).*

Moving The Multi-Pak

- *I received a Multi-Pak Interface for my CoCo as a Christmas gift. It seems to work properly when hooked directly to the expansion port on my computer. The problem, however, is that my computer desk is similar to a typing desk and*

(Ed Ellers, a RAINBOW *and* PCM *staff member, is a self-confessed electronics fanatic whose other interests include science fiction.)*

there isn't room for both the computer and the interface.

To solve the problem I constructed an interface cable about 38 inches long. I brought all 40 lines and the two grounding tab lines out of the computer to the Multi-Pak, but it doesn't work. The wiring is known to be correct, because the cable works fine for the disk controller and various cartridges. I tried a shorter (12-inch) cable with the same results. I then tried to shield and ground the whole cable with aluminum foil, and this helped, but the cable still wasn't reliable. Would you have any knowledge of a solution to this problem?

John J. Gallagher
Williamson, NY

The Multi-Pak Interface doesn't seem to be able to work with extender cables, because of the many signals that go back and forth between the CoCo and the Multi-Pak unit. You might try using a commercially available shielded or twisted-pair cable (available from industrial electronics distributors), but I'm hesitant to tell you to spend the money because it may well do no good whatsoever.

Printer Echo No Go

- *I read with much anticipation the hardware article dealing with connecting the 4-pin DIN plugs of the printer and modem together, so that everything appearing on the screen would be printed. I did the whole project, and then discovered that the Radio Shack DMP-100 printer doesn't have a 300 Baud setting. Is there any way to change the Baud rate setting on the DMP-100 to 300 either by software or by a hardware project?*

Craig Luecke
Brinklow, MD

The DMP-100's two Baud rates are fixed in the ROM inside the printer, and changing to 300 would be rather difficult. You could use one of the several serial-to-parallel interfaces on the market to pick up 300 Baud data and feed it into the DMP-100's parallel port. Note that this will only work if the system on the other end is operating at 8 bits with no parity; if 7 bits with even or odd parity is used there will most likely be garbage on the printer, because the characters with the parity bit added will correspond to special characters instead of regular alphanumerics.

32 or 64 — What's The Difference?

- *I have a 32K CoCo. I hear so much about having 64K, but I wonder what the difference is between my computer and the 64K model.*

Also, I have a short program that moves BASIC into RAM. Does that make my computer 64K?

Michael Rosenberg
Prestonsburg, KY

If your BASIC-in-RAM program works, then that means the machine in question is actually 64K. Radio Shack made a large number of machines between late 1982 and the middle of 1983 that actually had 64K of RAM; they only advertised them as 32K because none of the software they sold (until OS-9 became available) could make use of the all-RAM 64K mode. Some other machines were sold with 64K RAM chips installed, but were only wired for 32K because Tandy saw no need to provide 64K capability at the time.

Ed Ellers will try to answer any questions you may have about the CoCo and its applications. Send your questions to "Earth To Ed," THE RAINBOW, P.O. Box 385, Prospect, KY 40059.

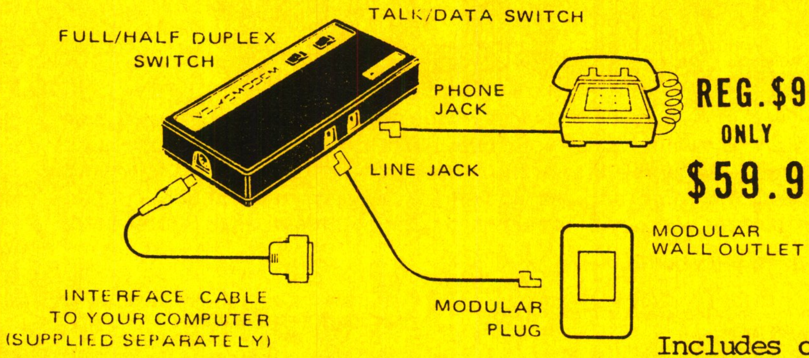
(Continued from Page 16)

Too long	2.6
Too many	1.8
Too few	7.2
Too generous	10.7
Too critical	0.3
Do our reviewers seem:	
Well qualified	37.0
Qualified	60.0
Under qualified	3.0
Do you wait to see a RAINBOW review before buying a product?	
Always	24.3
Usually	51.8
Sometimes	22.3
Never	1.6
Are you hesitant to buy from a new advertiser?	
Yes	57.4
No	42.7
Are you more inclined to buy after seeing a product advertised?	
Once	12.6
Two or three times	65.0
Six times	13.4
More than six times	9.0
Do you like the discount coupon pages?	
Yes	85.7
No	14.3
Do you like our issue themes?	
Yes	93.2
No	6.8
Do you use RAINBOW Check?	
Frequently	18.4
Seldom	35.2
Never	46.4
Would three-column listings of BASIC programs (in smaller type) be useful?	
Yes	36.3
No	63.7
Do you get RAINBOW ON TAPE?	
Yes	35.3
No	64.7
Age:	
18 or Under	17.2
19-25	8.6
26-35	22.3
36-45	29.0
46-65	20.2
Over 65	1.7
Occupation:	
Engineer/Technical	27.6
Professional	19.8
Business person	18.7
Student	18.3
Educator	7.5
Skilled Trade	5.0
Retired	3.0
Household Income:	
Under $10,000	9.2
$10,000-$20,000	10.1
$21,000-$30,000	21.1
$31,000-$50,000	38.2
$51,000-$75,000	15.2
Over $75,000	6.2

We had some other questions dealing strictly with the show itself and a few questions were so ambiguous that the response was statistically meaningless. For instance, there was hardly any numerical spread to the "rate our departments" and "rate our themes" responses; this is probably due to the poor wording of the questions, but could possibly be because the respondents had a wide disparity of opinions, each with their own favorites. In general, though, the results suggest that our columns on BASIC, letters to the editor and technical Q&A columns are most highly rated. RAINBOW Scoreboard and its accompanying Scoreboard Pointers were at the bottom. In regard to themes, apparently the most popular are graphics, hardware and data communications, while the lowest ratings went to our holiday (bah, humbug, yourself), music and Simulations. With more specific questions, we should be able to learn more when we poll those who attend the Irvine, Calif., RAINBOWfest. Then, maybe we'll be ready to poll the entire readership. In the meantime, a reminder that subscription rates are being slightly increased and that you can save money by subscribing, or extending your subscription, before the first of the year.

— Jim Reed

Introducing Volksmodem



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- Select 1 or 2 Stop Bits
- Send Control Characters
- Separate Keys for Escape & Delete (Rubout)
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★ **New Number One**

ANDRONE *(Radio Shack)*

40,030	★Matthew W. Swadling, North Vancouver, British Columbia
27,805	John Marcogliese, Eastchester, NY
27,450	Alan Bucior, Victoria, British Columbia
18,290	Bill Sain, Charlotte, NC
17,170	Jamie Schultz, Ontario, Canada

AREX *(Adventure International)*

29,794,900	★Barbara Blumenberg, St. Francis, WI

BAG-IT-MAN *(Aardvark)*

418,790	★Cornelius Caesar, Hofheim, West Germany
310,400	Eric Lecrouart, Ottawa, Ontario
109,620	Ronald Gates, Grand Rapids, MI
101,400	Daniel Belisle, Montreal, Quebec
70,510	Stephane Asselin, Hauterive, Quebec

BASEBALL *(Radio Shack)*

464-0	★Dave Fisher, St. Downey, CA
460-0	Walter Trainlips, Janesville, WI
324-0	Michael Rosenberg, Prestonsburg, KY
297-0	Joe Milligan, Julian, PA
296-0	Seth Newman, Yardley, PA
136-0	Stefan Mecay, Austin, TX
103-0	Rusty Johnson, Des Moines, IA
100-0	Chris Dunlap, Springfield, MA
40-0	Mario Asselin, Hauterive, Quebec

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24,600	★Michael Rosenberg, Prestonburg, KY
7,200	Lezlee Bishop, Salt Lake City, UT
3,600	Apollo Latham, Rich Square, NC
3,350	Eugene Watanabe, Salt Lake City, UT
3,300	Joey Lewis, Cabin Creek, WV

BUZZARD BAIT *(Tom Mix)*

6,447,950	★Jon Griffith
5,488,250	Jim Kennett
2,983,350	Blossom Mayor, East Greenwich, NY
2,902,700	Michael Popovich, Nashua, NH
2,087,650	Edmund Greene, Nashua, NH

CANYON CLIMBER *(Radio Shack)*

8,990,000	★Glen Giacomelli, Woodbridge, Ontario
2,326,200	Scott Oberholtzer, Lexington, MA
1,603,400	Shen Mansell, Calgary, Alberta
1,571,300	Jeff Weaver, Gordonville, PA
1,426,600	Sean Whitley, Arvada, CO
512,000	Lisa Veaudry, Midland, Ontario

CASHMAN *(MichTron)*

$25,320	★Chris Dunlap, Springfield, MA
$20,750	Melvin Pettuk, Nampa, Alberta
$19,330	Dan Ralston, Janesville, WI

CAVERN COPTER (THE RAINBOW)

1213	★Doug Schwartz, Glendale, AZ
968	Michael Mefferd, Wren, OH
790	John Rivers, North Adams, MA
760	David Figel, Sardis, OH
747	Susan Ballinger, Uxbridge, Ontario

CHOPPER STRIKE *(MichTron)*

162,400	★Andrew Figel, Sardis, OH
130,200	Benny Pischke, Lloydminster, Saskatchewan
87,600	David Figel, Sardis, OH
83,300	Doug Masten, Macon, OH
72,100	Lisa Siclari, Staten Island, NY

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143,300	★Moe Tindell, Sebring, FL
116,475	Jeffrey Kochs, Grove City, OH
116,470	Colin Kerridge, Ladysmith, British Columbia
114,140	Cheryl Pratt, Moab, UT
110,475	Andrew Truesdale, Ferguson, MO

COLOR BASEBALL *(Tandy Corporation)*

61-0	★Paul Brouwers, Ontario, Canada

COLORPEDE *(Intracolor)*

10,001,051	★Mark Smith, Santa Ana, CA
5,756,808	Scott Oberholtzer, Lexington, MA
3,355,248	Scott Drake, Pine City, NY
2,614,230	Jerry Petkash, Warren, MI
2,547,299	Rich McGervey, Morgantown, WV

CRUISING *(Sunshine)*

3,936	★Paul Hotz, Herzlia, Israel

DEFENSE *(Spectral Associates)*

48,350	★Jeff Kennedy, Scottsburg, IN
40,000	James Kennedy, Scottsburg, IN
37,000	Kevin Hawkins, Scottsburg, IN

DEVIL ASSAULT *(Tom Mix)*

4,569,305	★David Fitzpatrick, Ogallala, NE
3,096,900	Chad Barry, Rochester, NH
3,048,400	Brent Murphy, Mesa, AZ
2,890,000	Rich Van Manen, Grand Rapids, MI
1,762,980	Michael Rosenberg, Prestonsburg, KY

DOWNLAND *(Radio Shack)*

38,954	★Mary Ward, Groton, CT
35,539	Rusty Johnson, Des Moines, IA
23,000	Dan Feinstein, Mobile, AL
23,000	Doug Feinstein, Mobile, AL
22,304	Don Ward, Groton, CT
19,427	Albert Diaz, Canoga Park, CA

DRACONIAN *(Tom Mix)*

395,400	★Peter Kral, Arcata, CA
326,180	George Hoffman, Shavertown, PA
190,840	Kyle Keller, Overland Park, KS
139,010	Paul MacArthur, Gillette, WI
181,710	Bryan Jenner, Calgary, Alberta

DUNKEY MUNKEY *(Intellectronics)*

2,116,200	★Dan Price, Tacoma, WA
1,936,000	Tim Greenen, Sterling Hts., MI
1,244,400	Jack Baran, Bensalem, PA
1,015,000	Kyle Keller, Overland Park, KS

FIRE COPTER *(Adventure International)*

112,550	★George Dougherty, Hampton, VA
107,370	Chris Hafey, Auburn, CA
97,390	Sam Hughes, Colton, CA
78,860	Woody Farmer, Acme, Alberta
53,280	Kevin Marsh, Bokeelia, FL

FOODWAR *(Arcade Animation)*

104,075	★Mike Scharf, Fremont, OH
94,905	Stephane Asselin, Hauterive, Quebec

FROGGIE *(Spectral Associates)*

86,660	★David Garozzo, Morrisville, PA
84,440	Bill Ide, Newark, DE
74,050	Mike Garozzo, Morrisville, PA
73,190	Brendan Smith, Coral Springs, FL

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12	Lisa Ballinger, Uxbridge, Ontario
12	Kevin Oberberger, Sparks, NV
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GRABBER *(Tom Mix)*

147,600	★Brian Foley, Blackstone, MA
129,100	Blossom Mayor, East Greenbush, NY
70,600	Michael Corman, Lafayette, IN
31,900	Stephane Asselin, Hauterive, Quebec
27,750	Ellen Ballinger, Uxbridge, Ontario

HEIST (THE RAINBOW)

2,100	★Sergio Waisser, Mexico City, Mexico
1,500	Susan Ballinger, Uxbridge, Ontario
1,500	Julio Comello, Scarborough, Ontario
1,500	Kirstie Compton, Suffield, CT
1,500	Andy Dater, Medford, OR
1,500	David Figel, Sardis, OH
1,500	Tim Hoven, Eckville, Alberta
1,500	Joel Lombardi, Newark, DE
1,500	Jason Morrison
1,500	Jeff Roberg, Winfield, KS
1,500	Brendan Smith, Coral Springs, FL
1,500	Kevin Speight, Bridgewater, Nova Scotia
1,500	Rupert Young, Sheffield, MA

HYPER ZONE *(Computerware)*

59,830	★Mario Asselin, Hauterive, Quebec

INVASION *(Spectral Associates)*

88,000	★Kevin Hawkins, Scottsburg, IN
35,420	Jeff Kennedy, Scottsburg, IN

THE JUNGLE (THE RAINBOW)

1,110,729	★Tony Boring, Armagh, PA
644,694	Matt Hazard, Columbia Station, OH
29,735	Craig Boring, New Florence, PA
4,230	Doug Schwartz, Glendale, AZ
3,048	Jon Hobson, Plainfield, WI

KATERPILLAR ATTACK *(Tom Mix)*

65,682	★Jason Morrison
38,676	James Lafave, Williamstown, MA
31,672	Scott Fairfield, Williamstown, MA
18,949	Vadim Gotovsky, Toronto, Ontario

LANCER *(Spectral Associates)*

74,250	★Matthew Crabtree, Pittsburgh, PA

LUNAR—ROVER PATROL *(Spectral Associates)*

79,950	★Paul Hotz, Herzlia, Israel
45,600	Bryan Jenner, Calgary, Alberta

MAZELAND *(Chromasette)*

5,500	★Todd Knapp, Prairie du Chein, WI

MICROBES *(Radio Shack)*

178,550	★Apollo Latham, Rich Square, NC
144,350	Theodore Latham Jr., Rich Square, NC
98,450	Kent Jakway, Garrett, IN
59,960	Steven Allen, Sharpsburg, MD
40,850	Joey Lewis, Cabin Creek, WV

MOON HOPPER *(Computerware)*

114,540	★Susan Ballinger, Uxbridge, Ontario
78,820	Brian Austin, New Salisbury, IN
59,970	Cole McDonald, St. Cloud, MN
58,520	Brendan Smith, Coral Springs, FL
53,570	Robert Harmon, Virginia Beach, VA

MR. DIG *(Computerware)*

2,520,650	★Thomas Henry, Boca Raton, FL
2,371,550	Ann MacKery, Port Hardy, British Columbia
2,301,000	Jeff Roberg, Winfield, KS
1,976,500	Tim Magnusen, Lafayette, TN
1,881,350	Ellen Ballinger, Uxbridge, Ontario

MUDPIES *(MichTron)*

365,900	★Glenn Wasson, Castleton, NY
185,200	Bertha Jeffries, San Bernardino, CA
181,200	Anthony van Dijk, The Pas, Manitoba
173,900	Andrew Chin, Austin, TX
164,000	Paul Baker, Pittsburgh, PA
77,100	T.J. Buckley, Warrenton, VA

NINJA WARRIOR *(Programmer's Guild)*

157,400	★Sandra Maguire, Port Elgin, Ontario
151,100	Douglas Rodger, Harvard, MA
106,300	Bud Seibel, Tumbler Ridge, British Columbia
105,200	Martin W. Grimm, Elkview, WV
102,400	Christopher Gelowitz, Claresholm, Alberta

PAC 'EM (THE RAINBOW)

2,372	★Stephanie Gregory, Coco Solo, Panama
2,301	Lawrence Gore, Glencoe, AL
2,106	Dr. James Peterson, Radcliff, KY
2,059	Art Hartsough, Ft. Wayne, IN
1,999	Kevin R. Hubbard, Huntington, WV

PARACHUTE JUMP *(Jarb Software)*

62,650	★Dan Sobczak, Mesa, AZ

PARA-JUMPER (THE RAINBOW)

3,118	★Jon Clevenger, Lima, OH
822	Peter MacLeod, Montague, Prince Edward Island
783	Ronald Gates, Grand Rapids, MI

PIPELINE (THE RAINBOW)

478	★Susan Ballinger, Uxbridge, Ontario
302	Lisa Ballinger, Uxbridge, Ontario

POPCORN *(Radio Shack)*

64,380	★Susan Rushing, Tucson, AZ
57,860	Jeffrey Kochs, Grove City, OH
54,280	Wyatt Godines, Lawrence, MI
48,930	Paul Baker, Pittsburgh, PA
48,520	Nicole Freedman, Wellesley, MA
39,030	Susan Ballinger, Uxbridge, Ontario
23,540	Teri Block, Sewell, NJ

SCOREBOARD

PYRAMID *(Radio Shack)*

220/113	★John Dupre, Mobile, AL
220/130	Cornelius Caesar, Gundelhardtstr, West Germany
220/130	George R. Fairfield, Victoria, British Columbia
220/133	Robert Dickau, Sacramento, CA
220/136	Andy Nelson, Winona, MN
220/138	Ellen Ballinger, Uxbridge, Ontario

Q-NERD *(*THE RAINBOW*)*

6,512,020	★Ray Ravalitera, Bethune, France
326,810	David Chabot, Granby, Quebec
184,780	Ray Suplee
181,920	Susan Bennington, Pensacola, FL
130,000	Robert Dickau, Sacramento, CA

RAAKA-TU *(Radio Shack)*

50	★Mike Bubb, Grafton, OH
50	★Chris Cope, Central, SC
50	★Richard Gain, Tyler, TX
50	★John Kidd, Clarksboro, NJ
50	★Barney Laverty, Gauley Bridge, WV
50	★Michael Thomas, Flint, MI
40	Ellen Ballinger, Uxbridge, Ontario
20	Russ Auld, St. Petersburg, FL

RADIO BALL *(Radio Shack)*

1,103,090	★Mike Sengstock, Meriden, CT

REACTOIDS *(Radio Shack)*

3,781,815	★Rusty Johnson, Des Moines, IA
931,395	Linda Mobbs, Pt. Huron, MI
702,125	Jeff Loeb, Mobile, AL
203,800	Andrew Lehtola, Mound, MN
88,615	Robbie Anderson, Monrovia, CA

RETURN OF THE JET-I *(ThunderVision)*

406,788	★Chris Russo, Miami, FL
395,029	Joseph Russo, Miami, FL
389,453	Gary Bachtel, Huntsville, AL
208,602	Robert Buerkle, Conway, PA
188,000	Todd Kaplan, Lawrenceville, NJ
65,050	Todd Knapp, Prairie du Chein, WI

ROBOTTACK *(Intracolor)*

7,528,100	★Mike Scharf, Fremont, OH
3,242,812	Edwin Prather & Cory Soper, Oxnard, CA
2,516,050	Horace Hamilton, Calgary, Alberta
2,216,950	Randy Hankins, Tabor, IA
1,922,200	Erik Merz, Noblesville, IN

SCOOPER PACK *(Spectral Associates)*

5,000,000	★Jeff Kennedy, Scottsburg, IN
2,400,020	Kevin Hawkins, Scottsburg, IN

SEA QUEST *(Mark Data Products)*

100/147	★Harry Price, Tacoma, WA

SHOOTING GALLERY *(Radio Shack)*

149,940	★Robert Wallace, Waldorf, MD
85,120	Lezlee Bishop, Salt Lake City, UT
80,220	Vernell Peterson, Radcliff, KY
44,870	Mark Nichols, Birsay, Saskatchewan
44,480	R. Duguay, St. Bruno, Quebec

SKIING *(Radio Shack)*

01.10	★Mike Scharf, Fremont, OH
05.85	John Hokpins, Greenville, SC
12.02	Brian Austin, New Salisbury, IN
12.08	Kelly Kerr, Wentzville, MO
12.58	Kevin Hawkins, Scottsburg, IN
13.35	Jeff Kennedy, Scottsburg, IN

SKRAMBLE *(Tom Mix)*

61,020	★Paul Hotz, Herzlia, Israel
46,440	Steve Schutjer, Hazel Green, WI

SLAY THE NEREIS *(Radio Shack)*

344,115	★Ed Meyer, Vancouver, British Columbia
47,442	Joseph DiBattista, Brooklyn, NY
34,089	Craig Alexander, Heflin, AL

SNAKER (THE RAINBOW)

1:26	★Dan Sobczak, Mesa, AZ
1:57	Susan Ballinger, Uxbridge, Ontario
1:59	Baiju Shah, Deep River, Ontario
2:21	Eric Burk, Williamsvill, NY

STARBLAZE *(Radio Shack)*

11,000	★Steve Schutjer, Hazel Green, WI
9,950	Albert Diaz, Canoga Park, CA
9,700	Robbie Sablotny, Mt. Zion, IL
9,050	Mark Welte, Baxter, TN
6,850	Craig Alexander, Heflin, AL

STELLAR LIFE-LINE *(Radio Shack)*

100,070	★Alex Gatlin, McKinleyville, CA
33,100	Kenn Booth, Grand Rapids, MI
29,670	Craig Alexander, Heflin, AL
22,610	David Sullens, Cabool, MO
16,920	Jeff Loeb, Mobile, AL

STORM ARROWS *(Spectral Associates)*

35,000	★Stephane Asselin, Hauterive, Quebec

TIME BANDIT *(MichTron)*

413,620	★Doug Seibel, Tumbler Ridge, British Columbia
248,530	Sally Naumann, Hailey, ID
243,620	Mark Wooge, Omaha, NE
225,950	Chris Oberholtzer, Lexington, MA
142,200	Fred Naumann, Hailey, ID

TOUCHSTONE *(Tom Mix)*

98,500	★Glenn Wasson, Castleton, NY
88,300	Michael Mefferd, Wren, OH
65,520	Kevin Marsh, Bokeelia, FL

TRAILIN' TAIL (THE RAINBOW)

105,300	★Jerry Dill, Frankfort, MI
87,345	Philip Parent, Smiths Falls, Ontario
76,275	Michael Rosenberg, Prestonsburg, KY
74,395	Jean-Marc Parent, Smiths Falls, Ontario
33,454	Kenneth Bergenham, Lawton, MI

TUT'S TOMB *(Mark Data)*

163,060	★Michael McCafferty, Oceanside, CA
158,000	Chris Russo, Miami, FL
106,460	Eileen Kaakee, Royal Oak, MI
104,360	Gary Marshall, Layton, UT
60,780	Stephane Asselin, Hauterive, Quebec
27,320	Chris Dunlap, Springfield, MA

WACKY FOOD *(Arcade Animation)*

241,200	★Todd Kaplan, Lawrenceville, NJ
227,900	Jon Jenkins, Milner, GA
135,800	Mario Asselin, Hauterive, Quebec
105,100	Stephane Asselin, Hauterive, Quebec

WILDCATTING *(Radio Shack)*

250,450	★John Kidd, Clarksboro, NJ
33,090	Jack Ballinger, Uxbridge, Ontario

ZAXXON *(Datasoft)*

2,057,800	★Chris Oberholtzer, Lexington, MA
1,510,000	James Quadrella, Brooklyn, NY
666,000	Andy Green, Whitehall, PA
401,900	Mike Hughey, King George, VA
370,400	Chris Coyle, Selden, NY
150,050	Jeff Kennedy, Scottsburg, IN
135,000	Kevin Hawkins, Scottsburg, IN
102,000	Bryan Jenner, Calgary, Alberta
74,700	Mike Sengstock, Meriden, CT

Debbie Hartley

SCOREBOARD POINTERS

In conjunction with THE RAINBOW's Scoreboard, we offer this column of pointers for our game-playing readers' benefit. If you have some interesting hints and tips, we encourage you to share them by sending them to the Scoreboard, c/o THE RAINBOW.

PROGRAM EXCHANGE

Scoreboard:

Anybody looking for another insane CoCo user to trade programs with? I would appreciate it very much. It would make my gloomy day!

Todd Knapp
Prairie du Chien, WI

DRAIN PROBLEMS?

Scoreboard:

This is the best magazine that has ever been put out on the CoCo. It takes all the bits of information from a variety of sources and compiles it into one. Keep up the good work.

I have several Adventure games and the one that gives me the most problem is *Sands of Egypt.* I would appreciate it greatly if anyone can help out. I've found the pool, gotten in it, can't get out, and I know I have to drain it somehow. I've also found the big palm tree. Please send the solution if possible. My address is 51-2 Maine St., 94535.

Jeff McKay
Travis A.F.B., CA

THE 220 POINT QUESTION

Scoreboard:

In the game *Pyramid,* what happens at 220 points? Please write to let me know. My address is 501 Buckley Highway, 06076.

Chris Caovette
Union, CT

IN LIMBO

Scoreboard:

Help! I am having trouble with *Calixto Island.* What do you do after you go down the trap door? I can't get my flashlight on. Also, in *Black Sanctum,* I have found the beach house, but I can't do anything with it. My son and I will be waiting for your replies so we can get going. Write me at 1446 Marline Ave, 92021.

Liz Newman
El Cajon, CA

MISSION IMPOSSIBLE?

Scoreboard:

As it is neither practical nor possible for your editors to verify the legitimacy of your readers' score submissions, you cannot be criticized for publishing them, verbatim, on the assumption that they are genuine. No doubt, the possibility of deceit exists in any honor system.

Most (if not all) arcade-type games allow for phenomenally high scores. In contrast, logical (Adventure) games generally do not. Adventure games usually have a fixed, maximum number of point-scoring objects, and require a certain minimum number of moves to realize a particular score. Moreover, whereas someone who has achieved an unprecedented high score in a "shoot-em-up" game probably cannot duplicate that score on demand (perhaps never again), one who has reached an optimal solution in a determinate game should be able to reproduce that score consistently. With the exception of a trivial quasi-random element, the Adventure game *Pyramid* is a determinate game — solutions are replicable.

I do not believe that it is possible to score 220 points in *Pyramid* in less than 130 moves. The proof relies upon details of the program's (sloppy, but copyrighted) source code and data, and so will not be given here, but it is believed to be accurate and complete.

George R. Fairfield
Victoria, British Columbia

BEST BETS FOR BEDLAM

Scoreboard:

For those of you having trouble with *Bedlam*, pay attention! Get the red key in the Dispensary, but first go to the Maintenance room and get the hook. Go back to the Dispensary and type GET RED KEY WITH HOOK. If the man with the hypo gets you just type PLUGH. Go right outside the shock room and type GET GREEN KEY WITH HOOK. Now that you have everything you need, find Napoleon. Go to every room and type OPEN DOOR. Pretty soon you will find a secret door. You will not be able to open it, so ask Napoleon to open it and you're home free. I forgot to mention that in order to get Napoleon to follow you, type ASK NAPOLEON TO FOLLOW.

In *Raaka-Tu*, search each room by typing SEARCH ROOM. You should find a gem in a crack. That's 10 points right there. Also, you should never pull the lever, just get it.

In *Dungeons of Daggorath*, I think I have the list of rings:

NAME	INCANT TO
Vulcan	Fire
Lime	Ice

John Kidd
Clarksboro, NJ

CHOCK FULL O' HINTS

Scoreboard:

Here are some tips on *Black Sanctum, Calixto Island, Seaquest*, and *The Crown of Merro*.

To get past the natives on *Merro*, type LIGHT MATCH. Then type GIVE MATCHES. This will get you past them. To get past the poisoned arrows you must have the water. (You get this by pushing the nose on the fountain.) Type DRINK WATER. I'll give one more hint; you had better have your hacksaw before going in any further!

To get the caretaker's tools on *Sanctum* just give him the jug of wine.

On *Calixto*, always get the boots. To get the paddles you must have the mice. To get them you need the trap. Then go to the pyramid and DROP MICE when you get to the snake. Always remember to have the bucket with you when you cross the river!

On *Seaquest*, to get into the beach house you must break the window. (The beach house is behind the falls. Just type GO FALLS and you will be in the cavern. When you enter the cavern you will trip over something. That is the shovel. Type GET SHOVEL.) To open the clam you must have the shovel. To get to the clam you must buy the air tanks with the credit card. Then type FILL TANKS. Now you can go into the water.

If anybody has found a way to open the trapdoor in the beach house or has found a way to buy the speargun on *Seaquest*, then write to me at 390 St. Charles Ave., 32953.

Keith Schuler
Merritt Island, FL

PRESS AHEAD

Scoreboard:

I would like to pass along to the readers a little hint to use while playing *The Frog* from Tom Mix. I found out that on my CoCo 2 (64K ECB) the frog would only go once in any direction. Meaning that in order to go across the street you had to first press the up-arrow once, then go left or right before you could go ahead once more. I found that by holding down the space bar you could travel in any direction more than once. So by doing this, you can travel across the street or logs more than once just by pressing the up-arrow. If anyone knows of a software fix for this I am sure the readers that have this program would like it.

John D. Cleveland
Lunenburg, Nova Scotia

Scoreboard:

The game *Arex* has 32 different levels. After 32 it starts repeating itself from Level 12. At Level 60 you do not start out with any stars, but they do come into play. At Level 256 the game starts over with Level 1 and one star, and then increases the stars with the point value. The score only goes to 700,000 and I went through that 42 times.

This game also throws distractions in. When you get to the higher levels it will go slow and then all of a sudden it will speed up again. At times during the game it takes all your men away and you have to start over, but by then each square is worth so much that in a couple of moves you have one back.

The only help I can give in playing the game is to play aggressively. Go right after the stars. When you have 12 at a time you can usually get about 10 before they get you, if you go after them.

Barbara Blumenberg
St. Francis, WI

Scoreboard:

Enough is enough! I need help with *Sands of Egypt*. A recent pointer in the Scoreboard hinted that you need to place the scepter on the sarcophagus to get into the treasure room.

I know this is a dumb question, but how do you place the scepter on the sarcophagus? I can't even drop the darn thing!!

Send any help to P.O. Box 115, 20862. Thank you.

Craig Luecke
Brinklow, MD

Scoreboard:

I have solved the following Adventure games: *Dungeons of Daggorath, Pyramid, Arconiax Assignment, Bedlam, Calixto Island, Karrak, Crown of Merro*, and *The Trip*. If you need help with one of these Adventure games send a SASE and I will reply.

If anyone has solved *Pyramid 80*, I need help.

Chuck Poynter
Hector, AR

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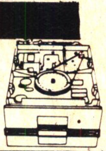

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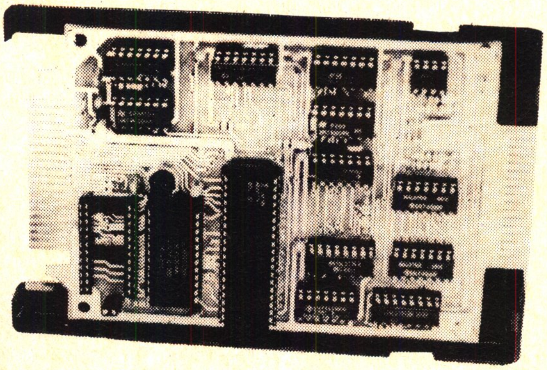

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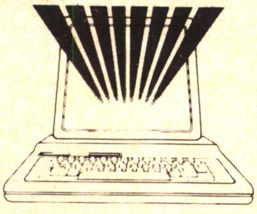

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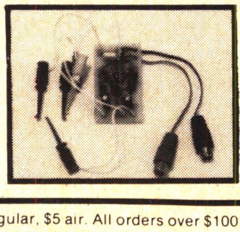

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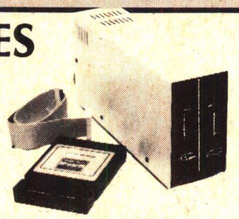

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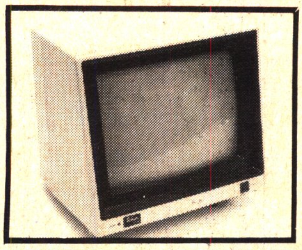

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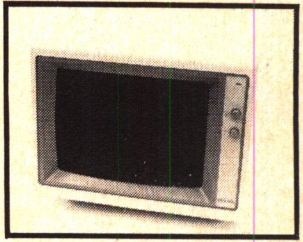

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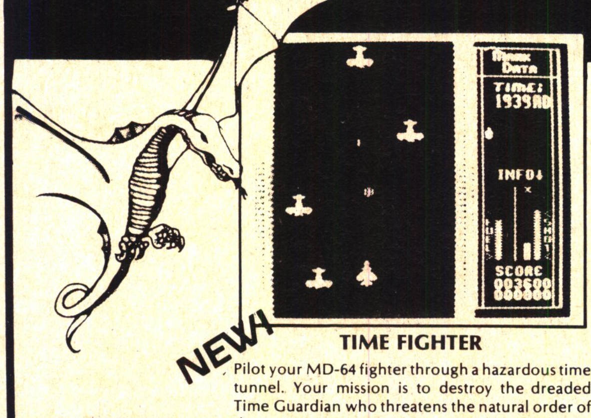

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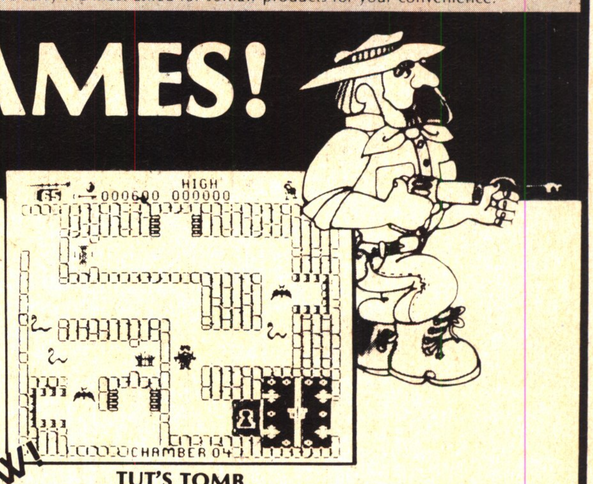

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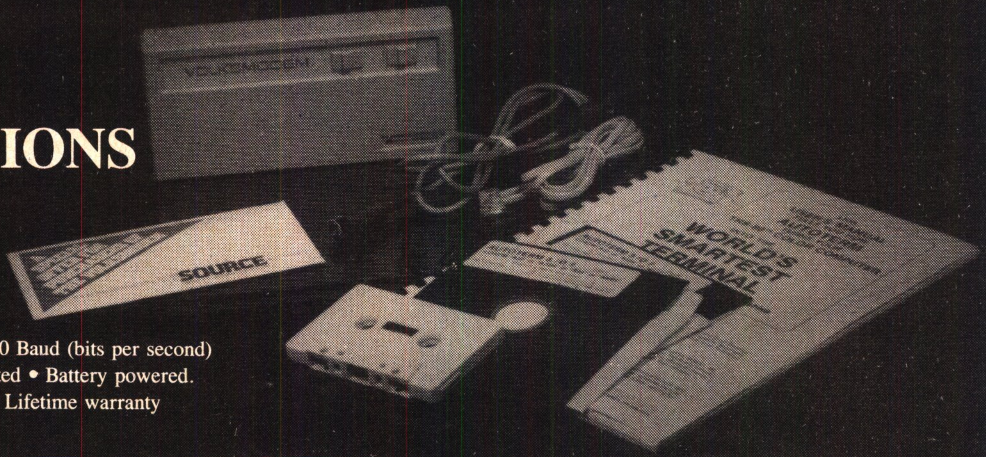
BLUE STREAK ALONE — 54^{95} SPECIFY PRINTER

COMPLETE DATA COMMUNICATIONS PACKAGE



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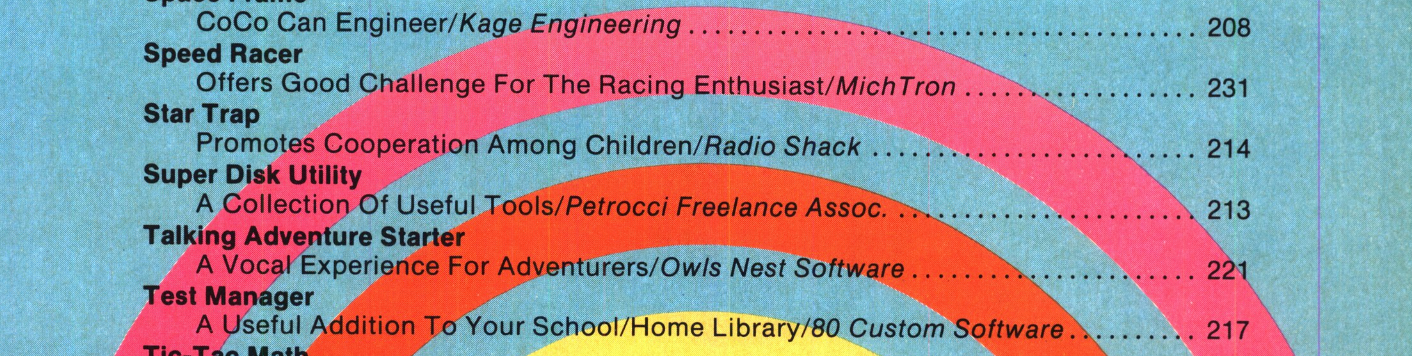

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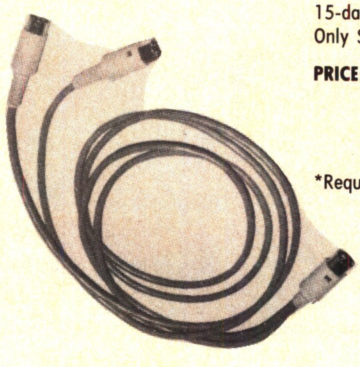
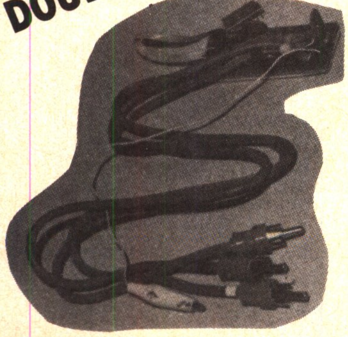


DOUBLE DRIVER



MINI-MOUTH

ULTRA TERM + Plus +

This program is the **ultimate** in CoCo communicating!! Ultra Term + is used with a plug-in 80 column board. Supports either Double 80 Plus, Color Power II or Word Pak.

Here are just some of the features Ultra Term + has to offer:

Select:
- Half, Full Duplex or Echo
- Odd, Even, Mark, Space or No Parity
- 7 or 8 Bit Words
- 1 or 2 Stop Bits
- All Caps if needed
- Several Printer Formats
- Trapping of incoming characters

BAUD Rates:
- 110-4800 (communicate)
- 600-9600 (printer)

Screen Format:
- 80 x 24 upper/lowercase
- Send all 128 characters from keyboard

Buffer:
- Merge text or programs
- 49K to 53K memory
- Four Buffer Send Modes
- Display Bytes Used/Remaining
- Editor—Move forward and reverse thru buffer. Insert, type over, delete lines, characters or words. Block delete.

10 Macro keys
Automatic Capture of incoming files
X on/X off capabilities
Send True Line Break
Transmit/Receive BASIC Programs, Files or Machine Code. No need to translate BASIC programs to ASCII Format.
Save/Load Macros or Parameters to Disk
Use 1 to 4 Disk Drives (w/SAVE, LOAD, DIR & Granule Display)
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Works on All Radio Shack Color Computers, and All Radio Shack Disk systems.

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PRICE:	Ultra Term +	$59.95 (Disk)
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BUILT IN SWITCH FOR COCO OR DOUBLE 80 PLUS
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OS9 DRIVER	12.95
FLEX DRIVER (available soon)	12.95
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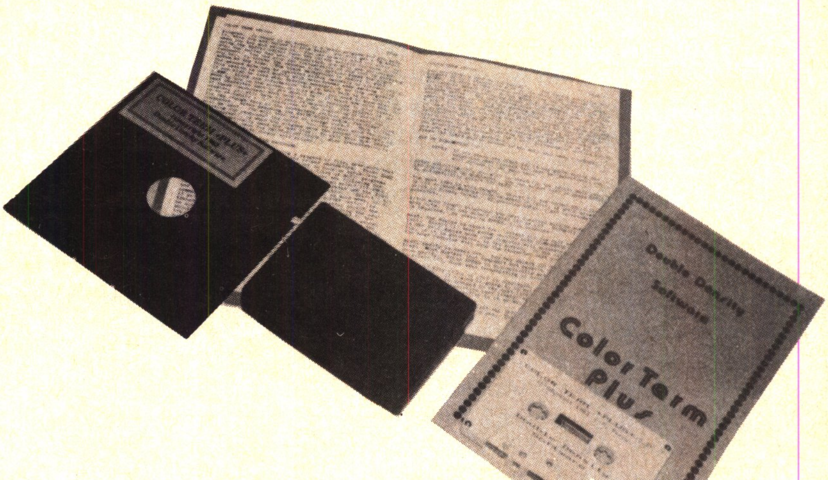
COLOR TERM + Plus +



Screen Format:
32 x 16, 42, 51, 64 or 85 x 24

BAUD Rates:
Printer—600 to 9600
Communicate—110 to 19200

Select:
Half or Full Duplex
Odd, Even, or No Parity
7 or 8 Bit words
Mask Lowercase if needed
Word Wrap—no split words
Reverse or Normal Video
Printer—Ignore/Add Line Feeds

Buffer Editor:
Insert, Delete, Type over
Block Delete, Block Insert

Communicate Mode:
Scroll Protect up to 9 lines
Three Buffer Transmit Modes
Send Control Characters

Disk Drives:
Display Directory, Free Space

Buffer:
Scroll Through Received Data
Print a Page or Print All

Works on all Radio Shack Color Computers, regardless of ROM type.

Price: ~~$39.95~~ (Disk/Tape)
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DOUBLE SPOOLER... No more waiting for your listings. This is THE spooling program!! 32/64K req. $21.95

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UNDERGROUND... How do you tame the guardian of Hell's gate?? Find the Golden Apple. 32K (disk) $19.95

COLOR KEY COMMAND... A powerful programmer's aid for a small price. Auto line number, Macro Keys, Copy Lines, plus more. Add real power to your Computer. Uses no memory in a 64K machine. 16K req. $19.95

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Double DOS II — Now use **35,40,**or **80** track (double or single sided) drives, all on one system, all at the same time. All regular disk commands are supported with Double DOS II and are totally transparent to your BASIC programs! You can get up to **158 granules** on a disk using an 80 track drive. These are the added commands:

NEW

BAUD 1-6... change the BAUD rate.
TRACK 35,36,40,80... change number of tracks.
DOUBLE... enable the double sided option.
PDIR... print your directory to printer.
DUMP ON/OFF... send programs without a terminal program.
RATE 6,35... change the head stepping rate.
VIDEO ON/OFF... reverse video without a hardware mod.
SCROLL 1-255... change your screen scrolling speed.
COMMAND... will list all new commands.
DUPE 0,1,2... will allow copy & backup from one side of a drive to another!
DATE... you can enter the month, day and year as an extension to your programs when they are displayed during a DIR command.

We **guarantee** that this program will work using the above commands, with all types of 35, 40 or 80 track drives!

PRICE: $29.95 (DISK ONLY) 64K required

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The following products recently have been received by THE RAINBOW, examined by our magazine staff and approved for the *Rainbow Seal of Certification*, your assurance that we have seen the product and have ascertained that it is what it purposts to be.

This month the *Seal of Certification* has been issued to:

PC Index is an organizational tool consisting of a packet of 40 cards printed on both sides to fit on the protective envelope of your 5¼″ diskettes allowing you to see at a glance the information a particular disk contains. ABACUS Computer Services & Education Group, P.O. Box 23438, Pleasant Hill, CA 94523, $2.95

Air Traffic Control Simulator, a 32K simulation designed to provide an orderly and safe flow of aircraft from their origins to their destinations following an established set of rules and procedures. You, as the controller, are given this set of rules as well as a choice of three levels of difficulty to develop techniques of skill, judgment and experience equal to performing the assigned task. Betasoft Systems, P.O. Box 1174, Smithtown, NY 11787, cassette $34.95, disk $37.95

The Designer, a 32K ECB Hi-Res program targeted for budding young fashion designers. Possible are the creation, saving and display of more than 1,000 style combinations in hundreds of color and fabric options. Cognitive Development Co., Suite 141A, 12345 Lake City Way, NE, Seattle, WA 98125, disk $24.95

Diet-Ade, a 32K program for health-conscious CoCo owners. A calorie counter is put at your fingertips, a calorie quoter tells you what to eat to attain your desired weight and a calorie minder nudges you to exercise to exceed your daily caloric limit. Color Connection Software, 1060 Buddlea Dr., Sandy, UT 84070, cassette or disk $19, plus $2 S/H

MAZERUNNER, a 16K ECB game requiring a joystick. As a member of the Maze Runner Corps, your mission is to fight off the forces of Ytirrod, the Pretender, from invading the Centrist Confederation and overtaking the Grand Dias from His Wisdom Arad Ennaed. You must destroy Ytirrod's fortresses by navigating remote controlled attack power sleds. Color Connection Software, 1060 Buddlea Dr., Sandy, UT 84070, cassette or disk $14.95, plus $2 S/H

Metabot, a 32K invitation to *le danse macabre* as you trick the menacing, mimicking Metabots into waltzing into fatal fences and lethal acid pots. Color Connection Software, 1060 Buddlea Dr., Sandy, UT 84070, cassette or disk $18.95, plus $2 S/H

CDSORT and **KEY-EXTR,** two 32K utilities requiring at least one disk drive. *CDSORT* allows the sorting of records of up to 256 bytes by more than one key field. *KEY-EXTRA* is designed to allow the extraction of key fields from databases and has the ability to include only specified keys in the extraction by means of 10 possible AND comparisons specified by the user. Computize, Inc., P.O. Box 207, Langhorne, PA 19047, disk $34.95

CONVERSIONS, a 16K ECB disk or cassette utility that makes short work of converting any unit of measurement to U.S., Imperial, or Metric. Choices include lengths, areas, volumes, liquids, weights and temperatures. Cozy Software, 25142-53 Ave., Aldergrove, British Columbia, Canada V0X 1A0, cassette $12 U.S., $15 CAN., disk $14 U.S., $17 CAN., plus $2 S/H

Disk Sort and Order, a 32K or greater utility requiring at least one disk drive. Compatible with Disk BASIC or *JDOS,* this program will sort directories alphabetically removing all "killed" filenames, change a Disk BASIC format of 35 tracks to *JDOS'* 40 tracks, restructure the entire diskette so that all granules for each file are sequenced saving wear and tear on the mechanical parts of your drive(s). Derby City Software, 3141 Doreen Way, Louisville, KY 40220, disk $11.95

SIDE WISE, a 32-64K program requiring disk drive that will read any ASCII text file from disk and print it out sideways down the page. Useful for obtaining printouts of spreadsheets that are too wide for the printer to handle. Fully menu-driven, *SIDE WISE* has selections of printer capabilities for Radio Shack, Epson, C-Itoh, Okidata and Gemini printers. Derringer Software, Inc., P.O. Box 5300, Florence, SC 29502, disk $19.95

Word Processor, a 16K ECB utility that includes ease-of-use commands such as; 'D'— displays whole file (except underlines) to screen as it will sent to printer; 'Z'—display of memory left and change of Baud rate, 'H'— help key displays list of commands. Drayon Software, P.O. Box 2516, Renton, WA 98056, cassette $5

ME-128-64, an upgrade kit to expand your 64K CoCo to 128K giving it a second bank which will run the same programs as the first bank. Complete instructions included. Dynamic Electronics, Inc., P.O. Box 896, Hartselle, AL 35640, $169

Multiprogram Manager, a 16-32K utility which when used with Dynamic's *96KX* allows the loading of five programs at once as a block. Dynamic Electronics, Inc., P.O. Box 896, Hartselle, AL 35640, cassette $14.95

Musx, disks one through five, a 32K monthly disk that plays eight to 10 current hits in four simultaneous voices with related graphics. GRAFX, P.O. Box 254, West Mifflin, PA 15122-0254, each disk $13.95 plus $2 S/H

Speed Racer, a 32K racing game requiring a joystick. The object is to pass the required number of cars for each lap. This number is indicated by an arrowhead under the "cars passed" marker. You must overtake these cars to progress to the next lap. Complete all five laps (10 miles) and you've won the race. MichTron, 576 S. Telegraph Rd., Pontiac, MI 48053, disk $34.95 cassette $34.95

Bakersfield KENO, a 32K ECB game of chance adapted from the game Lotto. The player chooses an initial bankroll and one to 15 numbers to wager on. The payoff on winners increases as more numbers are played and hit. It's possible to win 1,000,000 "dollars" with daring and prowess. SEIBYTE Software, P.O. Box 6464, Bakersfield, CA 93386

Chipaway, a 16K ML game requiring one joystick that pits your skill with a paddle and ball against a wall of multi-hued chips. Each color chip gives a different point value when hit. Options include FLIP, which flips the wall over thus displaying high point chips; COLLAPSE, which causes any chips above the chip that the ball hits to collapse down a notch and a game save routine. Sigma Software, 14024 152nd Avenue, S.E., Renton, WA 98056-7313, cassette $5.95

LINER, a 16K ECB game that casts you in the role of small game hunter. Your quarry: the tiny Eeblewalkers of Oktry who try and turn your system of locomotion against you. Michael Stuller, 2 Audubon Place, Rolla, MO 65401, cassette $7.95 plus $1.50 S/H

SBASIC, a 32-64K pre-compiler that adds commands and constructs to the CoCo. Among commands/constructs included are: *LOOP/UNTIL(), IF/THEN/ELSE/ENDIF, Continue, Quit* and 64K version allows source and object code in memory at once (save and retrieve with one keystroke). Tandar Software, 12 Araman Drive, Agincourt, Ontario, Canada M1T 2P6 specify disk or cassette $19.95 U.S., $24.95 Canada, $3 S/H U.S., $1 S/H Ontario and Montreal

MLBASIC, a 64K enhanced BASIC compiler designed to allow greater compatibility with existing Interpreter BASIC programs. A full compiler that features all of the commands available with Standard, Extended and Disk BASIC. *MLBASIC* offers additional commands to make it possible to interface programs with assembly language and write structured programs. WASATCHWARE, 7350 Nutree Dr., Salt Lake City, UT 84121 cassette $69.95, disk $69.95, disk $69.95 both $74.95, $4 S/H

The *Seal of Certification* program is open to all manufacturers of products for the TRS-80 Color Computer, the TDP-100, or the Dragon-32, regardless of whether they advertise in THE RAINBOW. By awarding a *Seal*, the magazine certifies the program *does exist*, but this *does not* constitute any guarantee of satisfaction. As soon as possible, these hardware or software items will be forwarded to THE RAINBOW'S reviewers for evaluation.

— Monica Dorth

Canadians
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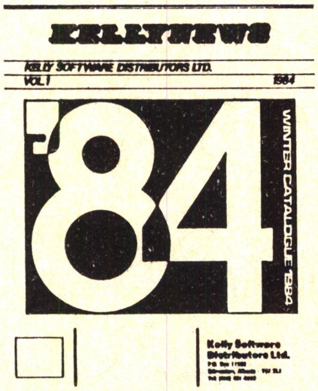
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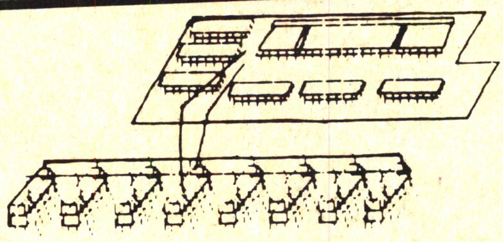

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REVIEWING REVIEWS

SUPER DISK UTILITY

Editor:

In regard to the review of *Super Disk Utility* I am returning a few facts that I feel need to be stated or clarified in the review.

It appears that the review is single sided towards the cataloging function and is not proportionally written with the functions supported by *Super Disk Utility*, and certain functions were not reviewed on their ability to do the task advertised or stated in the manual.

The reviewer states that there is not a search or find function in the catalog. When the program was originally written it was the author's choice not to include this function since a print function is provided to print the catalog in a neat, readable format. However, it should be stated that an updated version is being created which includes a search function and the following functions: Delete information in catalog, Add information to catalog. The fact that the same catalog can be sorted and printed in three different ways was neglected in the review of the catalog function.

The *Diskzap* function of the program does not review its functions; instead it merely lists them and includes a commentary on the display options (which I feel could have included a printout of the displayed disk sector and a command summary of the modification mode included on pages six and seven of the *Super Disk Utility* manual). An important feature of the *Diskzap* is the allocation table check and repair. If a disk develops a file structure error or an end of file error this function can be used to fix it and save some of the files on the disk. An example of testing this feature would be to back up a disk and modify track 17, sector 2 and change some of the first 68 bytes, (change a CO-C9 to anything other than CO-C9). Whether the *DIR* command in BASIC will find an error or not, the allocation table check will. Use this function and follow instructions on Page 8 of the manual.

It should also be noted that the sector skip factor is not a feature of just non-Radio Shack drives but is, in fact, a software controllable factor.

It should also be clarified that the *Diskzap 40* will work on standard Radio Shack disk drives, but it will not access above 37 tracks, and modifications to the program are allowed by the user for this purpose. The save directory feature is an important one to people who value their software—explanation: The Radio Shack DOS system is set up so that the drive head is on track 17 most of the time — reading and writing is done here every time a file is loaded or saved and failures in the drive can and do occur; therefore I created the save directory function to protect the disk from BASIC because BASIC does not access tracks 36 and 37.

I also feel that the section of the review on purge files, copy files, date files and directory sort could have gone more in depth on these functions. The reviewer neglected to mention the Super Directory function which uses the date function to get its dates and also computes the start, end and executing address of machine language programs. Each file is printed to the screen or to the screen and printer in a neat, easy to read format.

Bryan Woodruff
Petrocci Freelance Associates

Editor:

In response to Mr. Woodruff's comments on *Super Disk Utility*, I offer the following thoughts:

Mr. Woodruff's feelings about the "balance" of the review may well be just a difference of opinion between the supplier and consumer (albeit surrogate). I freely admit that I did not spend much time discussing some of the "bells and whistles" in the offering. Some of the items do things that are already built into the Color Computer while some others are the same as programs which have appeared in THE RAINBOW.

I am pleased to see that Mr. Woodruff is planning a revision to include a "search" function. This will add greatly to the utility value of the program.

Lastly, I agree with Mr. Woodruff that the "sector skip factor" is controllable on Radio Shack equipment but I felt that this would be of more interest to non-Radio Shack drive users since they might make more use of the function.

Robert E. Foiles
Lancaster, PA

MORSE CODE TEACHER AND TUTOR

Editor:

As both a reviewer for THE RAINBOW magazine and a CoCo software author, I couldn't help but notice Cynwyn's rebuttal letter (Reviewing Reviews Sept. '84) concerning the review of some ham radio software that was reviewed by someone who doesn't know much about the subject.

I have always been happy with the programs you send me to review because they fall into my lines of interest and experience. It shows great care on your part in most cases to line up programs with the reviewer.

I don't like to criticize the work of another reviewer but in this case I will. At the time that Cynwyn's *Morse Code Teacher and Tutor* was reviewed (June '84, Page 250) I was in the need for a program just like that. The review did not give me any of the important details needed to make a wise purchase so I didn't order it. Just recently I saw the program demonstrated and it was quite good, much better than the review.

For a small company like Cynwyn this review may have cost them that shot in the arm needed to succeed, even if in a small way, in the CoCo software world.

Here in the Bay Area, CoCo users put a lot of stock in THE RAINBOW reviews, and that's one of the reasons I try to do thorough reviews.

J. Michael Nowicki
San Jose, CA

STYLO III FOR OS-9

Editor:

In reading Dale L. Puckett's review, "Stylo III For OS-9 — What You See Is What You Get," Oct. '84, Page 192, I was amazed to read ". . . it shows them exactly what they are going to see on the printed page on the screen while they are typing it. *Stylo* is the only word processor that brings this feature to the Color Computer. Others feature screen editing, but they do the final text processing while they print."

This is a gross inaccuracy. *Telewriter-64* does just this — better known as dynamic formatting.

A. David Muir
British Columbia

PICTURE PUZZLE

Editor:

There seem to be some misconceptions concerning the program *Picture Puzzle*. First of all, nowhere in the documentation does it state that the user can create his own pictures using this program. To create pictures, we highly recommend a picture-designing program such as *Graphicom*. I believe the option the reviewer is referring to is the "Add Option." This will only allow adding a binary picture file into the picture directory.

Next, he refers to the poor quality of speech. We feel it is the finest speech available using single bit sound without any hardware. Poor quality could be the result of a poor speaker system.

We did try to return the reviewer's call on two occasions. I am sorry, but this matter did slip our mind. We make a conscientious effort to return every phone call and provide assistance when needed.

If you have any further questions, please do not hesitate to contact us.

Dennis S. Lewandowski
DSL Computer Products

Editor:

I agree with DSL's remark that their documentation does not mention how to create a new puzzle, however, let me explain why I found fault with this part of the program. The menu specifies, as choice number one, "Add New Boards." When this is chosen the screen shows, "Reading Data From Disk" and lists the three programs that come with *Picture Puzzle*. A question is then asked, "How many new ones?" You are required to type a number and the program then asks for the "filename". Thus, the menu option, plus these specific questions certainly implies that a picture can be added to the program by the user. In addition, the documentation stated that, in adding a picture, you should not use the same design in two squares of the puzzle. The documentation not only does not state that it is necessary to buy an additional graphics designing program in order to add a picture; it does not explain how to add a picture even if you do have one.

While DSL may feel that the "talking" of *Picture Puzzle* is best without using hardware, my opinion is that the result is of low quality voice reproduction. As I said in my review, it is a good attempt but far from perfect. Please realize that I feel the program itself is quite enjoyable and while the talking does not add to it, it does not detract either.

I am glad DSL tried to return my call. As a mail order customer who paid for a program and then made a long distance call to clarify the documentation, I strongly object to not getting a reply when I am told I will be getting one. Perhaps DSL, and other companies, could request a customer's telephone number and address. If the company were unsuccessful in returning a telephone call they could send a form post card stating, "Sorry! We tried to contact you but could not. Please either write us with your questions or call again."

Michael F. Garozzo
Morrisville, PA

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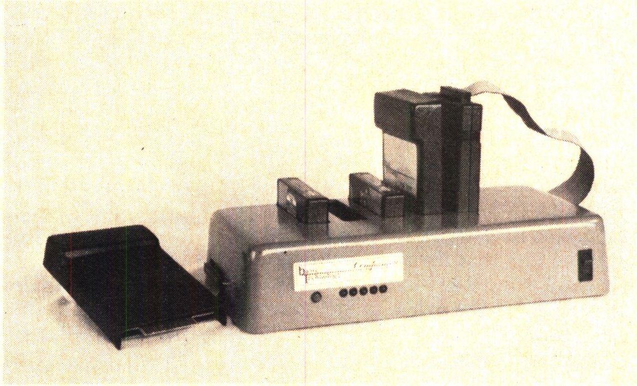

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Software Review

CoCo Checker
Best In Its Class

I first got involved with computers through my interest in electronics, and I got started in *that* by fixing TV sets. One of the beginners' books I read pointed out that the TV set would almost tell you what the problem was, if only you knew how to interpret the picture you saw. Computers are like that in some respects; as an example, if you find that you aren't getting any signal on your cassettes when you save a program, you can figure that the single-bit sound circuitry isn't putting out as it should be. A computer, being the versatile device that it is, can even help track down its own troubles, assuming enough of the machine is still working.

Radio Shack has been selling its *Diagnostics* cartridge ever since the CoCo came out in 1980 (it's still available by special order), but it has some limitations and tests only the computer itself. Spectrum Projects' *CoCo Checker* not only gives the CoCo a workout, but exercises the disk controller, disk drives, printer and Multi-Pak Interface, if you have them.

CoCo Checker comes on either cassette or diskette; I tested the disk version. Considering the nature of the program, a ROM pack might be more likely to be usable in some cases, but would be more expensive (and would make it harder to test the disk system). Bob Rosen at Spectrum suggested that if you have a disk system, you could copy the program from disk to cassette when you get it, so you aren't dependent on loading it by one means alone later on.

As one might expect, *CoCo Checker* has test routines for the cassette port, joystick ports, keyboard, serial I/O port, RAM, ROMs, sound circuitry and video generator; all of these are quite complete. The only RS-232 testing is part of the printer test, so you need a printer to check your machine's serial I/O circuits. (Radio Shack's cartridge uses a specially wired shorting plug, which they don't supply, to feed the CoCo's data output back into the two input lines.)

This test also gives a more complete test of the printer than the "self-test" mode it probably has, since it checks the entire signal path. The ROM checksum test is set up for all the ROMs Radio Shack has released so far. The keyboard test even checks the function keys found on the HJL, Key Tronic and Macrotron keyboards. There is even a test for timing accuracy, comparing the horizontal and vertical blanking interrupts to the master clock.

The unique features of *CoCo Checker* are the disk controller, disk drive and Multi-Pak tests. The controller test runs the controller IC through various steps and checks the interrupt line. The drive test checks drive speed and then writes a test pattern to the diskette in the designated drive and checks for errors. (This of course means a bad disk can cause a good drive to appear bad.) The Multi-Pak Interface test routine gives the unit's PAL (programmable array logic) chip a workout and also checks the select switch circuit.

If you do any repair work on CoCos at all, this program is an absolute must. Even an ordinary user can benefit from *CoCo Checker*, as it tells you whether or not the system is working properly and even what to tell the repair technician when it isn't. Now if only there was a video cassette that could do this sort of thing on TV sets!

(Spectrum Projects, Inc., Box 21272, Woodhaven, NY 11421, or Box 9866, San Jose, CA 95157-0866, $19.95 plus $3 S/H)

— Ray Edwards

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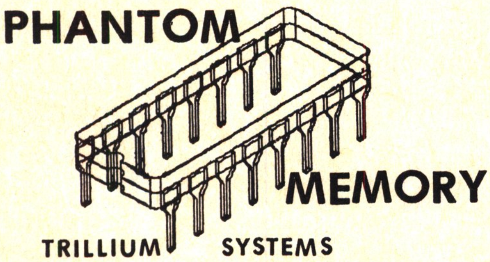

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The game itself is a work of art in every way. The puzzles are fun and challenging, you can use complete sentences, abbreviations, short phrases, and there are several milestones on the way to success. Of course you can save the game in progress.

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Picture Puzzle is perfect for those of you who like to unscramble puzzles without having the extreme of a Rubik's Cube. In addition, the disk version "talks." I feel that the "talking" is similar to listening to a person using a poor quality loud speaker system. It is a good attempt at producing software speech but is far from perfect.

The puzzles are very well done. In addition to the numerical puzzle (one to 48), there are two picture puzzles. These are the "hat shape" (this design is featured in DSL's advertisement), and an optical illusion design triangle. After the disk version says, "CAN YOU SOLVE PORKKA'S (author) PUZZLE? PLEASE CHOOSE ONE OF THE BOARDS FROM MENU," the menu appears and you can choose which puzzle to unscramble. The program shows you the completed form of the puzzle and then clears the screen and mixes up the puzzle by scrambling the 48 squares. You then have five minutes to unscramble the puzzle by moving the squares. Each square is moved into the one blank space by using the four arrow keys. By manipulating the blank space you can reassemble the puzzle. The author realized that it would be necessary to view the completed puzzle from time to time, so there is a help key, 'H', that pauses the timer and allows you to see the completed puzzle. When you are out of time, the disk turns on and announces, "TOO BAD, YOU'VE RUN OUT OF TIME. JUST A MOMENT. LET ME SEE IF YOUR SCORE IS IN THE TOP TEN." If your score is a high score the program will ask your name and save your score on the disk. You can continue with another puzzle or repeat what you have just done. If you solve the puzzle the statement, "CONGRATULATIONS! YOU HAVE SUCCESSFULLY COMPLETED THIS ROUND," appears and the computer then allows you to play again. But each time you solve the puzzle the computer scrambles the puzzle more than it did previously. This is truly a never-ending game.

There is a bonus section on the disk that states that you can create your own puzzle pictures. The instructions say not to have two areas of the puzzle exactly the same or the puzzle will look solved but may have the two blocks swapped. This will cause the computer to lock up.

This is the section I had problems with. The directions are limited and do not explain how to make up or design a puzzle for the program. On the menu selection of "add new boards," the only thing that happens is that the program writes a new title to the disk. This new title will appear on the menu but there is no way to develop a new design. In order to solve this problem I telephoned DSL Computer Products. Their office was closed on the day I called (Monday) but a tape recording said that if I left a message they would get back to me. I explained the problem and left my phone number. They did not return the call. I do not appreciate getting a tape recording telling me an office is closed and I despise being told to leave a message if no return call is planned. I should mention that I waited eight days for a response. Many computer users rely upon mail order companies and those companies should be able to work with and help purchasers of their programs.

Should you purchase *High Resolution Picture Puzzle*? Well, do not buy it for the "talking," and do not buy it for designing your own puzzles, but buy it because the author, Joe Porkka, has done an excellent job of giving you new puzzles to solve and hours of fun.

(DSL Computer Products Inc., P.O. Box 1176, Dearborn, MI 48121, 32K Ext. BASIC, tape $9.95, disk $12.95)

— Michael F. Garozzo

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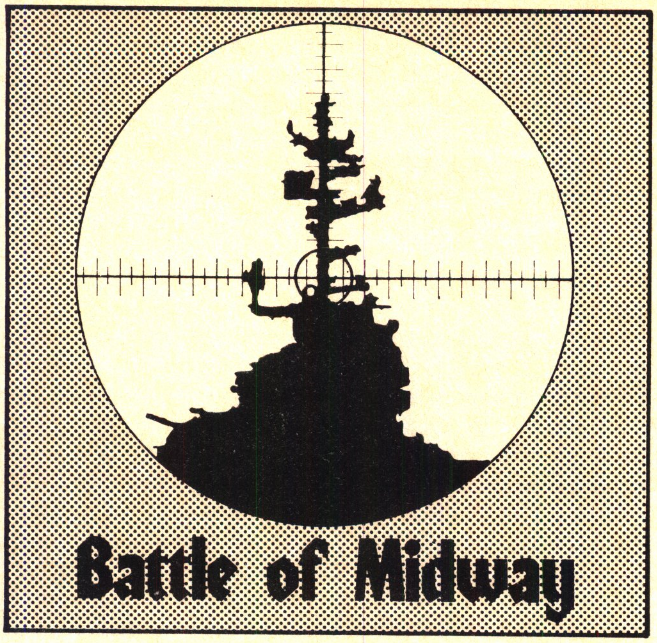

CINC PAC — Battle of Midway 32K

Ark Royal's masterpiece game of naval strategy of perhaps the most important battle in the history of the United States Navy. Hi Res graphics, 75% machine language allows player to control as many as 41 separate units on the screen at one time. Command Task Forces 16 & 17 as they play cat and mouse with the Japanese fleet. Maneuver the Hornet, Yorktown and Enterprise into the best position. Set courses and launch search and attack aircraft then hope for the best. Find the enemy fleet, then pick the targets: Akagi, Soryu, Kaga, Yamato and others in this historically accurate game. Relive history, Admiral, and it won't be any easier this time around. Anchors Aweigh.

Game save. Requires disk version to operate on disk. Cassette $27.95.

COMPANY COMMANDER

COMPANY COMMANDER 32K

Game module 1 — **House to House.** Ark Royal's squad level WWII infantry combat game.

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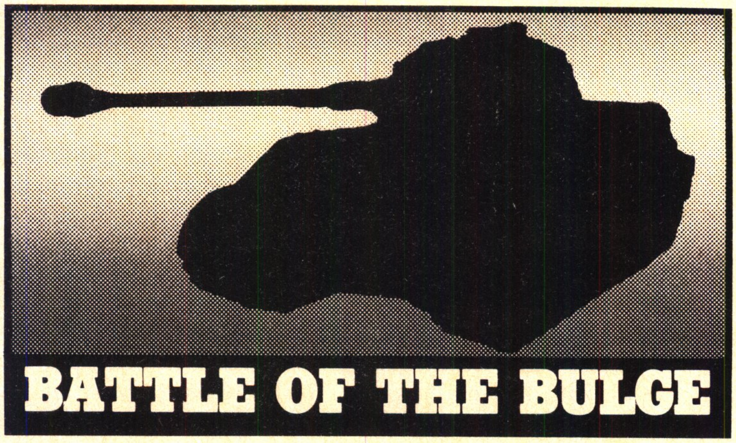

BATTLE OF THE BULGE 32K

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Option 1 Is Number One

Are you tired of digging through that old small appliance box trying to find a canceled check, only to find it in the very bottom? Or devoting an entire wall of filing cabinets just to store all those checks? If you are like me, you always seem to lose the checks that you might need later. Maybe you have one of those little critters that eat some of your canceled checks (I can never figure out how these little critters seem to know which one to eat).

We finally have a Cash Disbursement Program that will stack up against the big boys called *Option 1* by YGS Software.

After loading *Option 1* you are greeted with the maple leaf from our beautiful sister country, Canada, then you are prompted to enter your own unique password (if the wrong password is entered you will be presented with an illegal usage message and forced to shut down all equipment in order to regain control of your system).

Next will be the main menu consisting of:

1) Issue Checks
2) Record deposits
3) Transfer tape file to disk
4) Sort/View by payee or account number
5) View records by check
6) Obtain balance excl. pay
7) Change records

After your selection has been made, each routine will be loaded into the system individually. When issuing checks or recording deposits a check will appear on the screen and prompt the user to input all of the correct data. The printed checks feature detailed stub printing, account number, reference number, dollar amount, check number, discounts, payee, address, city, state, ZIP code and memo.

Option 1 is designed to print on formatted checks available through New England Business Systems, however if you have your own pre-printed checks you may have to alter the printer driver to accommodate your own needs. Whichever the case, *Option 1* prints crisp, clean checks at the touch of a button.

The program checks every keystroke making sure the correct data is keyed in the proper place, resulting in the process being somewhat slow, but on the other hand it could be a timesaver by keeping the user from keying in an entire check all over again. After practice the process could become considerably faster.

Option 1 is machine language and consists of a printer driver for the Epson MX-80 printer or compatible. If you do not have a compatible printer you can write your own printer routine, or you can send your printer's manual to YGS and they will write a routine for your printer at an hourly rate. Also if you ever want your password changed you can send the original program to YGS and they will change your password for 15 percent of the current retail price of the entire package.

The disk can be backed up but is not executable; first you must back up the disk with normal backup procedures and place your new copy someplace out of the way. If your original disk ever becomes inoperable you can copy the backup back onto the original disk (if the original disk is damaged the backup procedure will not work).

A few suggestions that I feel should be in business software are:

Two disks should be included in the entire package, eliminating down time as a result of sending the original disk in for a password change.

Option 1 is written for a one-drive system. An option should be included using a two-drive system, eliminating the need to switch between the main disk and a data disk. (There is a lot of disk switching involved.)

If the user forgets to take out the main disk and place the data disk in the drive and tries to save any data onto the disk without removing any write protect device, the system will crash, resulting in a loss of data that was just input from the keyboard. The system must be reset and reloaded in order to regain control. There needs to be an error trapping routine in this section to eliminate the would-be loss of what could be valuable information.

Upon receiving my copy of *Option 1*, I was blessed with a bad disk copy. After fighting with the disk trying to get it to load, I made a phone call to YGS Software. Assuring me that they knew what the problem was and it had been corrected, they sent me a new copy promptly. My experience with YGS was both courteous and a pleasure as they handled my problem tactfully and swiftly. So throw away that old small appliance box and devote all that wasted wall space to your CoCo and, above all, run that little critter that eats all those important checks out of business . . . I did.

(YGS Software, P.O. Box 208, Brechin, Ontario, Canada L0K 1B0, $56 U.S., $69.95 Canada)

— Bob Brown

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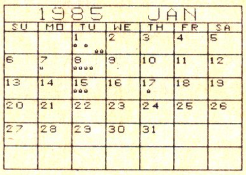

1985			JAN			
SU	MO	TU	WE	TH	FR	SA
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

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- Requires 32K in BASIC

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```
   1
  43
 +69
 102
1+4+6=11
```

HELP YOUR CHILDREN HELP THEMSELVES

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Tic-Tac Math Improves Arithmetic Skills

Tic-Tac Math is a tic-tac-toe game in Hi-Res graphics combined with exercises in solving math problems (addition, subtraction, or multiplication, *no* division) at a level of difficulty chosen by the student at the start of each game.

Tic-Tac Math is easy to *CLOAD* and *RUN*. All other instructions and an explanation of the game can be displayed while using the program. After the title page you are offered a choice of three types of problems: addition, subtraction and multiplication. You must then select the level of difficulty (easy, medium or hard). The level of difficulty in *Tic-Tac Math* is *not* increasingly more difficult problems such as two- or three-digit numbers, but rather a decreasing amount of time available to answer the problems! Easy gives you three seconds, Medium — two seconds, Hard — one second. All of these times can be changed by passing through the instruction screen, which comes up next after selection of difficulty. If you choose not to see the instruction screen you go directly to the gameboard screen, and the timer remains at one, two or three seconds.

The instruction screen gives you brief instructions, an explanation of the game and the opportunity to either increase or decrease the response time allowed for each problem. The documentation (one typewritten sheet) gives a conflicting explanation of this response, but the program's screen was correct: Pressing the 'U' speeds up the response time (gives you less time to answer) and pressing 'D' slows down the time (gives you more time). For each time the 'U' or 'D' is pushed, the time is decreased or increased by a factor of 1.5, e.g., the Easy level originally gives you three seconds. Pushing 'D' once gives you 3 x 1.5 or 4.5 seconds. Pushing 'D' again will result in 4.5 x 1.5 or 6.75 seconds. Pushing ENTER on the instruction screen sends you to the gameboard screen.

The gameboard is drawn and divided into numbered squares (one through nine). You are prompted to choose a number and are in full control of which squares are to be played. You do not have to play a square just to block the computer. Immediately after choosing a number, a problem appears on the screen to the right of the gameboard and the timer begins. If the problem is answered correctly and within the time limit, the student wins the square with an 'X'. Each correctly answered problem gets one of three responses placed on the screen: "CORRECT," "GREAT," or "TERRIFIC." If the time runs out or the answer is incorrect, then the computer wins the square with an 'O' and "INCORRECT" appears on the screen.

If neither you nor the computer wins the game by the time all the squares are played, the board is rebuilt and play begins again using the options selected for the previous game. If you are successful and complete a tic-tac-toe, you are rewarded with ascending notes and "YOU WON" is placed on the screen below the board. If you lose, "COMPUTER WON" appears and descending notes are heard. You then go back to the selection of the type of problem and start the cycle over again. If you do not pass through the instruction screen, the timer is set according to the difficulty selection and does not keep the setting of the previous game. This bothered my kids somewhat at first.

A couple of things bothered me about *Tic-Tac Math*. First and foremost is the level of difficulty. The differences between difficulty levels using a time factor are somewhat insignificant as the student can pick the Hard level and transform it into a Super Easy level through the instruction screen, as my son, age seven, usually did. The unmodified Hard level is very discouraging even for an adult math major with touch typing. Mentally one knows the answer the instant the problem is placed on the screen. However, finding and pressing the right keys in less than one second is very difficult.

I much prefer the option of working with more difficult numbers. This was also expressed by my oldest daughter (age 10). The actual range of numbers used are one-digit numbers from two to nine. There are no ones or zeros. The student is given no second chance at a wrong answer and more importantly, I feel, there is no correct answer shown if your answer is wrong.

Nevertheless, my son still enjoys and talks about *Tic-Tac Math* even after several days of playing. *Tic-Tac Math* can provide the slow learner in math with ample time to solve problems and be rewarded with the accomplishment of getting tic-tac-toe. And it can provide competitive excitement to those early grade school students who are more masterful of mathematics. If your children are in the early development stage of math, *Tic-Tac Math* can provide a good foundation for basic math while they enjoy playing a game of tic-tac-toe.

(Wish Software, P.O. Box 7366, Johnston, RI 02911, 16K ECB, tape $24.95)

— Kenneth D. Peters

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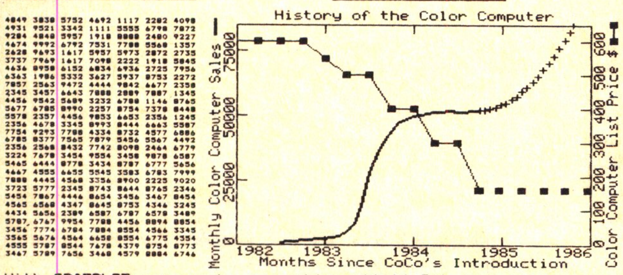

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Play The Lottery With *Lotto*

With taxpayers across the country jerking their collective knee at the mere mention of raising taxes, some of our state governments have initiated lotteries that give everyone an equal chance at becoming a millionaire and at the same time lotteries bring in some much needed revenue to the state coffers.

Like most other gamblers, lottery players have their own techniques of selecting the winning numbers to write on their ticket. Some use special dart boards, patent numbers on manhole covers or intricate formulas like multiplying their birth date by their social security number and then dividing that figure by the total albatross population of Tasmania. It's no wonder that in this high-tech world someone would write a program to handle the number selection process for you.

This program, called *Lotto,* requires 16K cassette and is written in BASIC. All you do to get started is to *CLOAD Lotto* and *RUN.* The instructions scroll across the screen at a very slow rate and it takes about two minutes for them to complete. No hard copy documentation is included, or for that matter, is needed.

Lotto is written using the state lottery rules as found in Maryland, but instructions are given for making the simple changes to match the rules in any state lottery. Unfortunately the line numbers referenced for change are not accurate or complete and some knowledge of BASIC by the user will be required to spot the error and make the right changes. A spelling error was noticed on one of the screen prompts but that can be easily fixed as well.

What does this program do? It picks out 40 or more different random numbers and displays them on the screen for you. It uses BASIC's *RUN* command to get the numbers but as many of you know, there is a bug in the *RUN* command that can be somewhat cured by including a program line that includes the statement *X=RND(-TIMER).* This fix is not included in the program so the random numbers generated are not quite as random as they could be.

During the number selection process the text screen is flashing a different color for each number generated and then all 40 numbers are displayed in no particular format or grouping.

Even if there were no bugs or errors in the program, the low purchase price does not justify plunking down any amount of cash for such a simple program that even a novice programmer could hack out in about five minutes.

(RAM Publications, 1088 Poplar Tree Drive, Annapolis, MD 21401, tape $5.95)

— J. Michael Nowicki

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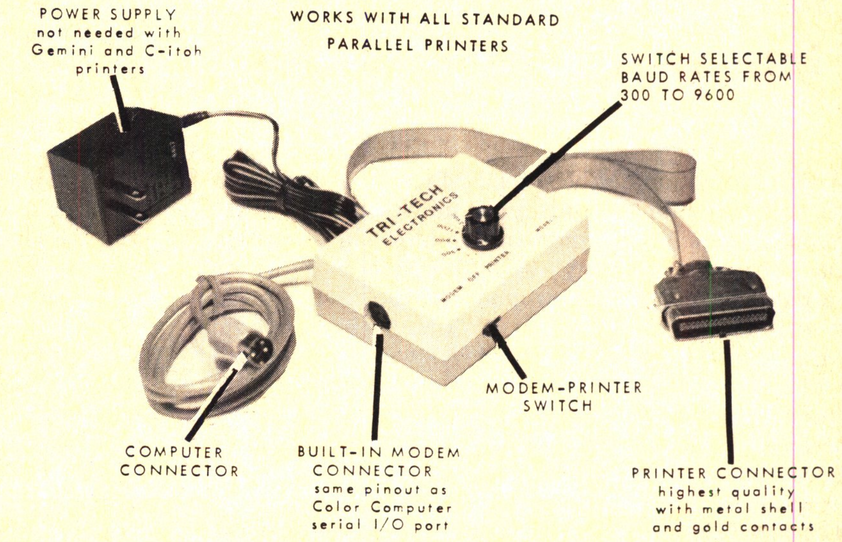
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The Animator Turns CoCo Into An Animation Studio

A lot of attention has been focused lately on computer-generated animation used in popular movies like *Star Wars,* commercials and even demonstration films like *Panasonic Plane* (where the company's 3-D TV system is shown off by a paper airplane flying around a house). Next to this sort of thing (which even local TV stations are using for news and weather coverage these days), what you typically see on your home computer looks rather tame. Triad Pictures' *The Animator* can give you a taste of computer-generated animation on the CoCo, and teaches you about the way studios like Warner and Disney do animated cartoons.

The program's sections are arranged (and named) like the departments of a film studio. The "background studio" is where you draw the backgrounds for the scenes. The "cel animation studio" lets you draw the various objects (as if on the cellophane sheets used for film animation), and the "camera department" combines backgrounds and cels to create the finished picture. The "sound effects studio" lets you add sound to the picture, and the "screening room" is where you watch the finished presentation. Finally, the "lab" makes copies of the film or of the background and cels.

The background section is more or less a normal Hi-Res screen drawing program, working only in *PMODE 3.* You can move and draw in all directions using the arrow keys, change colors and paint enclosed areas. The cel animation section is similar, only here you are drawing as many as 32 small objects (or variations on an object) instead of a whole scene. The cel printer function lets you "take a picture" of a particular cel and "print" it in one or more cel locations, so you can repeat all but a small part of an object.

In the camera department you combine the background and the objects on the cels to form frames. In each frame you can place one or more of the cels over the background in desired positions (or have a frame with no objects), then shoot a frame and go on to the next. When you have shot all the frames in your sequence, you cut the end of the film and return to the main menu. There is also what the author calls a "rotoscope;" it's similar in function to the 8mm home movie editors that used to be common (or more like a good industrial video recorder), in that it lets you look at the film step-by-step or at normal speed in either direction. You can even put the "film" back in the "camera" at any desired frame (sounds more and more like video, doesn't it?) to shoot over from a desired point. You can shoot up to 625 frames.

The sound effects section has 12 commonly used sounds in its library. To use a sound effect you simply use the "rotoscope" viewer to locate the point at which you want it to come up, then select the desired effect and press 'I' for insert. Finally, the screening room "projects" the entire

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cartoon with sound — and does it over and over without stopping until you press 'D' to go back to the main menu. The lab saves or loads a background, a set of cels, both of them or an entire presentation (consisting of background, cels and instruction codes to re-create the finished product).

All the basic functions are explained in the first half of the manual; the second half is a 16-page animation textbook written by the program's author, Dwayne Osterbauer. In it he talks about advanced animation techniques in great detail; he speaks mostly in "film" terms (I get the feeling that he's either a very avid cartoon buff or has been/is in the business himself), but fully explains how they fit on the CoCo using his program. Several demonstrations are provided that go with the book.

The one thing that, more than anything else, causes the obvious difference between *The Animator* and real animation is not the relatively low resolution (it doesn't seem so bad), but the low frame rate, roughly seven or eight frames per second. Motion seems much jerkier than even the low-budget Hanna-Barbera cartoons, which were shot at only 12 frames per second. The frame rate is understandable, given the juggling act involved in moving cels (the program has to redraw the cels over the background for each frame and add sound, all in real time).

The Animator's graphics can, of course, be recorded in one of several ways. If you have a video recorder, just feed the CoCo's RF output into the VCR's VHF antenna input, set the recorder tuner to the right channel and away you go. Unfortunately, it's very difficult to stop the tape at exactly the right point for the end of a scene and restart for the beginning of the next scene (if that's your intention) on home-type recorders. You could also use an "XL type" Super 8 camera on a tripod to shoot from the TV set (older movie cameras don't work well in this application); editing is more precise here, and if the camera has a single-frame option you can place one frame of animation on each frame of film, bringing the frame rate up to 18.

The Animator certainly is a one-of-a-kind package; I've never seen something like this on any other home computer. This seems like a very good buy for the CoCo.

(Triad Pictures Corp., Box 1299, Sequim, WA 98382 cassette $35)

— Ed Ellers

One-Liner Contest Winner . . .

For those of you who like nice, neat printouts of disk directories, this will do the job nicely. Simply put your printer online, insert the desired disk in drive 0, ENTER its name and the program does the rest.

Dave Helfrich
New Port Richey, FL

The listing:

```
10 PRINT#-2:INPUT"DISK NAME";X$:
PRINT#-2,X$:PRINT#-2,"----------
----------":POKE111,254:DIR:PRINT
#-2:PRINT#-2,"FREE SPACE"FREE(0)
"GRANULES":PRINT#-2:PRINT#-2,"--
-----------------":GOTO10
```

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Adventure* and its companion *Rainbow Adventure Tape*.)

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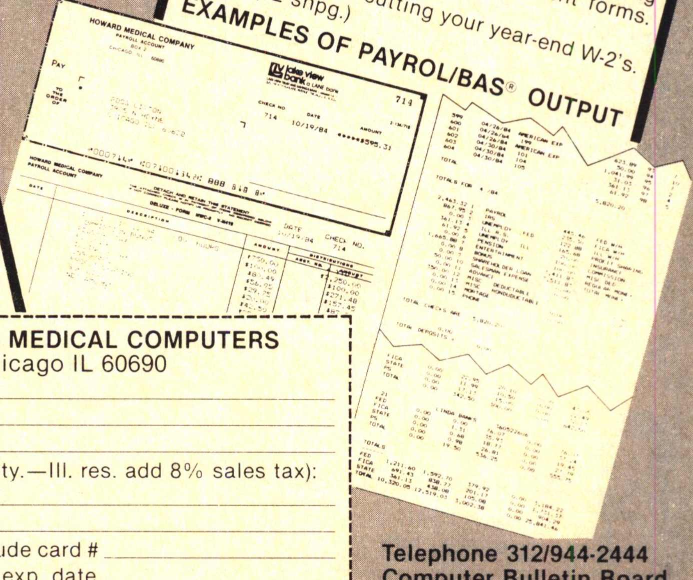

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Organize Your Disk Library With *Where's-It*

By A. Buddy Hogan

Have you ever asked yourself, "Now where is that program that lets me copy files from one disk to another without doing all that typing?" Or some similar question that has to do with a lapse of memory concerning the location of a program on a disk? Everyone who has a disk collection of more than a few disks will ask such a question sooner or later. *Where's-It* is a utility that allows you to answer such questions. It is a straightforward program that does what it is advertised to do.

Where's-It is simply a disk index database management utility program. It allows you to create a database consisting of the directories of as many of your disks as you desire (however, no more than 972 program names can be used to build each index). You are then able to manipulate the data to suit your needs. *Where's-It* is supplied on disk and is compatible with the 32K Extended BASIC Color Computer and requires at least one disk drive. The main program is written in BASIC while the sort routine is provided as a separate machine language program on the disk.

Upon running *Where's-It*, you are presented with a well designed menu screen that displays the nine options available to you. I'm going to list these options as they would be used rather than in the order presented in the menu (software developers would do well to present menus in this manner so that they are more useful):

1) ADD NEW DISK — This is the option that allows you to input the directories from your disks. The procedure is very simple. You are asked for a disk identifier (not more than five characters long) and then are directed to place the disk in the proper drive (the documentation tells you how to modify the program for two-drive operation). The directory is then read in very fast and you are asked for another disk identifier so that you can quickly add as many disk directories as you desire. I used 13 full disks containing 340 programs to test *Where's-It* and was able to build the database in less than seven minutes. The program actually stores the program name, the extension and the disk identifier for each program on the disk being added to your index.

2) SORT — allows you to sort the contents of your database in alphabetical order without regard to upper- or lowercase. The sort is fast since it is done in machine language. My 340 program index took less than a minute. An audible tone lets you know when the sort is complete. A nice feature would be the option to also sort by disk identifier. This way you would be able to see at a glance all of the files on a particular disk. You would obviously have to be able to store the identifier sort as a separate file.

3) LIST INDEX — prints the index file to the screen 10 programs at a time. ENTER advances the screen display to the next ten programs. An up-arrow returns you to the menu.

4) PRINT INDEX — prints your index file on an 80-column printer in three columns with a maximum of 162 program names on each page (54 in each of the three columns). This is where the 972 record limit comes from (six pages of 162 each). The printout is clearly the most impressive feature of this program. The print routine was written for an Epson FX-80 and provides a title for each page of the printout that displays DISK DIRECTORY INDEX at the top in expanded print. The next line, still in expanded print, is FILENAME: XXXXXXXX - PAGE X where the X's are substituted with the proper filename and page number. The printout continues with three columns, each headed with FILENAME EXT DISK. These headings are in the normal Epson print font and are underlined. The print routine then prints out the filename, extension and disk identifier for each program that is contained in your index. After 60 lines, it skips to the top of the next page, places the printout title lines and column headers at the top and continues the printout.

5) SEARCH — lets you find either a program by name or a particular disk by the identifier that you have assigned to it.

6) DELETE/UPDATE DISK — you may delete the directory of a disk from your index or add the directory of a disk that you have updated since it was first entered into your index by selecting either DELETE or UPDATE. You are then prompted for the disk identifier of the proper disk.

7) SAVE FILE — your index file is saved to disk with this option. If you started the current session by loading an index or have saved the current index once before during the current session, you may save the index by simply ENTERing up-arrow after selecting this option from the menu.

8) LOAD FILE — is used to load a previously saved index from disk.

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9) MAKE NEW FILE — erases any data in memory and allows you to start building a new index. Since this is a destructive feature, the program prompts you to be sure that you want to use this option.

At the bottom of the menu display is the filename of the index that was loaded, the number of programs contained in the index and the number of programs that can be added to it.

The program prompts you for input by flashing the cursor at the proper location. Input is taken immediately without the need to hit ENTER except for a filename or identifier. Error handling is excellent. If you have a problem while using the program, just ENTER BREAK and then *GOTO 100* to get back to the main menu. You are not allowed to select options that require an index to be in memory if you don't have one there and you are not allowed to SORT or SEARCH if you only have one record in memory.

The documentation consists of five 8½ x 11-inch sheets of yellow paper printed in the normal fashion and folded in the middle. The documentation is adequate but could be improved. It leaves one wondering just how you are to begin to use the program. If you follow the sequence of the options as presented, you begin with MAKE NEW FILE (which talks about erasing the contents of memory — before you have entered anything into memory) then go to *LOAD* (you have nothing to load yet) and *SAVE* (save what?) before you get to ADD NEW DISK (which is where you begin).

The most glaring omission from the documentation is in the part that describes the *PRINT INDEX* option. You are told that the print routine was written for an Epson FX-80 and you are told that you might need to change some of the print variables (these are identified along with the line number where they need to be changed). However, when you get to the section on the Baud rate, you are informed that the Baud rate for the FX-80 is 9600 and that, "You may have to delete this line or replace it with some other value." End of instructions. It would not have been that difficult for the distributor to have informed purchasers of the program of the values needed to be used in Line 801 for the various Baud rates that different printers require. My Epson MX-80 worked just fine after Line 801 was deleted. Running it with Line 801 produced garbage on the printer since the Baud rate was much faster than my MX-80's 600 rate. Perhaps this observation comes under the heading of nitpicking since the owners of printers that run at other than the standard CoCo 600 should already be aware of the value that they need to poke into memory location 150 to produce the required Baud rate.

Where's-It is a worthwhile program that performs as advertised and would be a welcome addition to the collection of CoCo disk users who have accumulated enough programs on disk that they have to ask themselves that troubling question from time to time, "Where's it?".

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CoCo Can Engineer With *Space Frame*

Because I used overlays years ago to "shoehorn" a major rotary-winged aeroelastic analysis into an early mainframe, I *know* 16K is big enough for serious work! Because I have edited reports for publication, I *know* a word processor is not a glorified electric typewriter. A spreadsheet is as far ahead of a hand calculator as the calculator is ahead of a slide rule.

But when the disparaging question is posed, "Can you really do anything *professional* on that little machine?", a negative answer can result from a limitation in the software market. I do not expect to find a supersonic wind tunnel calibration program in this magazine, and if I want another aeroelastic program (Color Computer compatible), I had better write it myself. In short, professional, specialized software is in short supply and the Color Computer user should be glad of any high quality additions to this market.

That is why Kage Engineering's release of a finite element structural analysis program is good news. Structural analysis means "Is a structure strong enough?" Can your roof withstand a snow load, or is the TV antenna mast adequate? Finite element means to do the analysis by visualizing ("modeling") the structure as if it were composed of a large number of little springs, usually metallic. The method is in common use in the aerospace industry, and was used on NASA's space shuttle.

Of course, when simplified to a home computer, a number of subtleties are sacrificed. *Space Frame* does not include buckling or torsion effects, works entirely below the plastic deformation range, and defaults to steel unless told otherwise. (That would be minor for most users, but for us aluminum addicts it means overriding a default on each and every element input.)

As far as I know, this program has no competition, so it is *Space Frame* or hand drudgery for many engineers in private practice.

Kage Engineering claims it will run even on 16K. My CoCo is a 64K machine. I have used it not only for the test cases supplied, but even to analyze a fairly complex sphere I designed. The program can use the high speed poke, but I have only tried that on one simple model — it worked fine. Without the high speed poke, a 24-element, 16-node model took about 13 minutes to run. I would consider that time quite acceptable.

The program does retain three dimensions, which means it can do real world problems as well as teach engineering. The documentation is relatively complete, and the two examples will refresh the memories of engineers who are rusty on this discipline. I encountered two problems in using the program. On my most complex model, the node deformation table which printed out at the end was not consistent with the element deflections printed just above. That may indicate a bug, or may be a problem in my model of the structure, it is hard to tell.

My other problem was on I/O. *Space Frame* provides the capability of saving one's input to cassette at two distinct points in the analysis. The first worked as advertised; I never was able to recover data saved at the second point. I do not consider that problem serious because most users could discipline themselves to use the first option. Conversion to disk appears simple — I know how to, but not having disk I did not bother. The progam drove a Radio Shack DMP-200 properly with no problems.

Space Frame is supplied with a utility to enable 64K users to get 8K extra by disabling Extended BASIC. The utility worked properly, and would seem a good idea for most users because it is very difficult to tell in advance how much storage a complex model will require. For most users, the program will be adequate, but I would not suggest trying to model the Eiffel Tower on a CoCo!

So long as I have access to more elegant and larger versions free through my employer, I would personally have little incentive to buy this program. (I am licensed for private consulting practice, but am not doing any.) However, were I doing consulting — or even teaching at the university level — I know of no other program available in this field and I found *Space Frame* did its job properly with no major criticisms. I look forward eagerly to more specialized engineering software from a firm that clearly put together a good product.

(Kage Engineering, P.O. Box 3010, Lakewood, CA 90711, cassette $50)

— H. Larry Elman

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Run CP/M With *Color Power II*

By Peter A. Stark

Originally written in 1973 for the 8080, CP/M is undoubtedly the grand-daddy of microcomputer operating systems. There isn't a 6809 version of CP/M, but it is still possible to run it on the Color Computer with the addition of the *Color Power II* module which, through a combination of hardware and software, puts a Z-80 microprocessor on the Color Computer bus.

CP/M has one feature which distinguishes it from the others — its tremendous popularity. This popularity has led to the availability of thousands of programs. While some of these may not run on the *Color Power II*, there is still a huge base of available CP/M programs, both large and small.

The Hardware

Color Power II (I'll refer to it as *CPII* from now on) is a metal box, about the size of Radio Shack's computer cassette recorder, which plugs into the expansion port on the right side of a 64K Color Computer. The disk controller, in turn, plugs into the right side of *CPII*.

CPII itself contains more than two dozen integrated circuits. To avoid loading down the CoCo power supply, *CPII* has its own supply in the form of an external power transformer that plugs into a wall outlet and connects to a jack on the back of the *CPII*.

Inside *CPII* is a Z-80 CPU, a 6845 video controller, 2K of video RAM memory, an EPROM character generator, and an assortment of unmarked TTL ICs. The entire assembly is very professionally constructed, with gold-plated connectors and a solid support for the entire assembly.

Since the *CPII* provides a display of 24 lines by 80 characters wide, in both upper- and lowercase, a good video monitor is needed. *CPII* does not provide an RF output like the CoCo's; a composite video output jack must be connected to the video input of the monitor.

The CP/M Disk Operating System

CPII comes with a copy of CP/M version 2.2. The *CPII* disk is supplied in a dual format — track one and part of track 17 are in Radio Shack format, while the rest of the disk has CP/M files. To start CP/M, you must type *LOADM "CP2"* and then *EXEC*. This loads a boot program, switches to 64K mode, and then loads and starts CP/M itself.

Once CP/M is started, operation will be very familiar to anyone who has used another DOS on the CoCo. CP/M has a number of built-in functions such as DIR (to display a disk directory), ERA (to erase a file), REN (rename a file), TYPE (display the contents of an ASCII file), SAVE (to save memory contents to the disk), or USER (which allows a sort of segmented directory structure). These can be run by just typing their names followed by any arguments that they need.

Typing any other command causes CP/M to look on the disk for a command file by the same name. If found, that file is executed. *CPII* comes with the following CP/M command files on the disk:

PIP is a 'Peripheral Interchange Program.' It is used primarily for copying one or more files from one disk to another, although it can also transfer files or data to and from disks, keyboard, display or printer. PIP cannot be used to copy files on a single drive.

STAT can be used to display the status of disks or files. For example, since DIR does not tell the size of a file or how much space remains on a disk, STAT can be used to provide this information.

SUBMIT and XSUB allow you to set up often-used combinations of commands as disk files and then call them with a single line command.

ED is the standard CP/M text editor. It is a line editor rather than a screen editor; this means that you do not see an entire screen full of text at one time, but only see the line you are currently typing on or perhaps the few lines directly above it, and you cannot use the cursor keys to move back and forth through your text.

ASM is the standard CP/M 8080 assembler. It uses 8080 mnemonics rather than those of the Z-80 which is used in the *CPII*.

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LOAD is used along with ASM to convert the output of the assembler into a form which can be loaded and executed.

DUMP is a program for printing out the contents of a disk file in hexadecimal. The assembly language code for this file is also supplied, both for experimenting with the assembler, and also to show how user programs may be written to access CP/M.

DDT is the 'Dynamic Debugging Tool,' a debugging monitor program. It allows you to list or modify memory and start or trace programs.

CPII Implementation of CP/M

The *CPII* implementation of CP/M consists of two parts — the adaptation of CP/M itself and a collection of command programs for use with it. (This review describes version 1.5 of *CPII's* CP/M software.)

Adapting CP/M to a new computer involves writing some code known as BIOS — the Basic Input Output System — which is the link between CP/M and the hardware of the computer. In *CPII* this code links the core of CP/M to the CoCo keyboard, display, printer port and disk interface.

CPII lets the keyboard generate the full 96-character printable ASCII character set, plus control codes such as Control-C (used to restart CP/M) and ESC (used in many commercial programs). Many of these can be generated by single key closures, while some codes require that you press two keys at the same time.

As mentioned earlier, *CPII* includes a high resolution 24 x 80 display interface. Since this display is handled by hardware rather than software, it can provide excellent display quality if used with a good monitor. The video interface program which drives that hardware has been programmed to emulate the popular LSI ADM-3a terminal, so that programs written for the ADM-3a will drive the *CPII* screen in the same way. This is especially important for those programs which move the cursor around the screen. The only disadvantage in this case is that video display is much slower than we are accustomed to with regular CoCo BASIC.

CPII uses the standard CoCo printer port in the back of the computer. It allows operation at rates from 300 to 4800 Baud, with either seven or eight bits per character, and with either one or two stop bits. It also allows selection of whether line feeds will be fed through or not, and how the printer handshaking will be done. This covers a wide variety of printer configurations, both Radio Shack's and others'.

The disk interface portion of the BIOS is quite interesting in itself. According to the folks at Color Power Unlimited, they found that the Z-80, even running at 4 MHz, was not fast enough to handle the disk interface at double-density speeds, so they decided to let the 6809 in the CoCo handle that part of the job. The result, they say, is a complex blend of Z-80 and 6809 programming and hardware for which they have applied for a patent.

CPII uses the same basic disk format as CoCo disks — 35 tracks of eighteen 256-byte sectors each. This is quite different from CP/M's 128-byte sector, and so they pack two of CP/M's sectors into one CoCo sector. The result is a total of 146K of storage on one disk. (It is possible to use up to 40 tracks, but 80-track or double-sided operation is not possible.) A by-product of this disk format is that CoCo Disk

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BASIC's regular *BACKUP* can be used to copy *CPII* disks, and *DSKINI* is used to format them.

In the area of disk-resident commands (CP/M calls them transient commands), *CPII* comes with four of its own command programs:

RESET quits CP/M and returns to Radio Shack Disk BASIC.

SYSGEN is used to generate a CP/M system disk for the *CPII* system. SYSGEN cannot, however, initialize a fresh disk, rather, it only modifies a standard CoCo disk for use with CP/M. Hence, to set up a new disk you must return to Disk BASIC (with RESET), use *DSKINI* to initialize the disk, and then return to CP/M and use SYSGEN to prepare it for use with CP/M.

CONFIG is used to change some of the CP/M parameters to fit the individual hardware used with the CoCo. It determines printer port parameters such as Baud rate (300 to 4800 Baud), number of data bits and stop bits, type of handshaking, and whether line feed characters are allowed or kept from the printer. CONFIG is also used for redirecting output from the printer to the screen or vice versa, and for setting disk drive parameters such as number of tracks (35, 36 or 40) and drive step rate (six through 80 milliseconds). Although CONFIG allows use of up to 40 tracks on a disk, the need to use BASIC's *DSKINI* command to format disks usually means that only 35 tracks can be used.

CONVERT is the largest and most ambitious *CPII* command. It permits *CPII* to read 18 other popular CP/M disk formats, including those written on Access, Cromemco, DEC, Eagle, Holmes, Kaypro 2, LNW, Lobo, Morrow, NEC, Osborne, TRS-80 Models III and 4, Xerox, and Zenith computers. Not all formats can be read since *CPII* cannot read single-density disks, 8-inch disks, hard-sector disks (such as North Star CP/M disks) or Apple II CP/M disks; nevertheless, the CONVERT program does allow access to a large variety of software from other machines. Note, however, that this is strictly a one-way street — CONVERT does not allow you to write disks which other machines can read. In addition, CONVERT does not let you read or write your regular CoCo Disk BASIC disks so there is no way to transfer data files, text files or BASIC programs to or from regular Disk BASIC.

For the user who wants some of the almost classic CP/M programs, Color Power sells copies of *WordStar, SpellStar, StarIndex* and *MailMerge*. Even when included with the *CPII* adapter, the total price is often less than the price of the individual programs on the open market. Due to a lack of documentation, I was not able to test these, but they do all seem to work. Also available is a communications program called *UltraTerm+*.

Documentation

CPII comes with a 29-page manual which covers the basic aspects of the *CPII* system and how to use it. This is a far cry from the two thick manuals which came with my copy of CP/M-68K (which runs on a 68000). The *CPII* manual leaves a lot of unanswered questions, and does not cover some programs (such as the ED editor, ASM assembler, or DDT debugger), at all. It suggests that the user purchase one of the many CP/M manuals, and gives a suggested bibliography.

User Comments

On the whole, the *Color Power II* system is a very solid piece of professional equipment. Aside from the lack of adequate documentation (which should probably improve with time), there is little one can seriously fault it with. Most problems noted were small ones, typically the kind that show up in any new product.

For example, *CPII* allows a fairly good implementation of *WordStar* and *SpellStar*. But a small problem occasionally causes this combination to scroll an extra line, so that when *SpellStar* comes back to rewrite the screen it writes one line lower than it should, thereby causing some confusion. Also noted was the fact that the BREAK key, which usually can break any program, does not work within *WordStar*.

The lack of a BASIC interpreter is also a small problem, especially since CP/M cannot read or write CoCo disks. (Since every other DOS for the CoCo has such file convert utilities, I am sure it's only a matter of time until they are available for *CPII* CP/M as well.) As a test of the CONVERT program, I got a public domain CP/M disk prepared for the Kaypro 2 computer. Though I was able to convert and read all of it, it was a challenge to figure out a way of using the BASIC programs on it. (I eventually transferred them to another computer via the serial printer port.)

(Color Power Unlimited, Inc., P.O. Box 606, New Providence, NJ 07974, $329. With *WordStar* and *MailMerge*, $498; *SpellStar* and *StarIndex* $79; *UltraTerm+*, $55.)

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RAMDOS Is A Good Disk-Type Tape Program

RAMDOS is a tape-based utility program designed to use part of available memory as a storage area to stack several programs while the rest of memory is active. The machine language routine allows for the user to departmentalize the memory by use of a *CLEAR* statement and an *OFFSET* to protect a portion of RAM. The program provides for a disk-type operating system to facilitate the movement of programs from or to storage or active RAM. The intent is to be as close to using this storage RAM as a virtual disk. The method used by the program author is that the user moves into the program routine by entering an *EXEC* and then selecting the appropriate command for execution and then leaving the routine to return to the active RAM area again.

The disk-like operating system of the program includes commands to save a program from active RAM to storage RAM; list all the program in storage; rename a program; kill a program; clear all programs from storage; a 'help' menu which list the commands; a 'Q' command which returns the user to BASIC; and a 'restore' command which transports a program from storage to active RAM. All of these commands acted on the programs without trouble and faster than the blinking of the cursor!

The number of BASIC programs that might be stored depends on the length of the individual programs (and the amount of space reserved for storage). In a typical configuration of several short programs, each may be loaded sequentially in the storage RAM. The user then has the option of calling up any of the stored programs to the active RAM. In the transfer from storage to active RAM, the active RAM is wiped clean, thus this system was never intended to pass data between programs, or act as command stream system, or provide for linking or chaining of programs.

As noted earlier, the system works best with a group of short BASIC programs. Machine language programs may be used in this system, but such machine language programs must be assigned specific locations through the use of "offsets" at loading time so as not to overwrite the host program. The routine has trouble handling very long BASIC programs because of the memory limitations imposed by dividing the RAM into an active and storage segment. The division of RAM space is accomplished by use of *CLEAR* statement and loading *RAMDOS* with an *OFFSET.* The selection of a coupled set of *CLEAR* and *OFFSET* statements which provides for allocation of the RAM is the problem. If the user selects a combination that allocates most of RAM to storage, then the user might encounter the OM Error when trying to *CLOAD* a long program. Likewise, allocating too little RAM to storage will result in an OM Error if this large program does not have enough room to be stored.

The program, once loaded, functions smoothly and is fast. The selection of the proper sequence for loading with *CLEAR* and *OFFSETs* is the hardest part of the whole operation. The manual offers an example in which the user is instructed to *CLOADM RAMDOS* with an *OFFSET* then enter *CLEAR,200* with a number one less than the *OFFSET.* With that example the user is left to his own experimentation. One other instruction is offered in which the manual indicates that if the user has Extended BASIC, then a *PCLEAR 1* is necessary before loading the program. (Interestingly, one of the long programs used for the test required a *PCLEAR 4* and after following the manual's suggestions, the program when returned to active RAM would not work.)

The manual's major shortfall is not being more informative on the loading patterns to be tried for different needs or RAM size. The manual's title page notes the program will run on 16, 32 or 64K computers. While true, it should be noted that it is compatible with only the lower 32K of the 64K equipped computers. The manual suggests that some bank switching programs might work with *RAMDOS* if the jump table is maintained. No test of a bank-switching routine was attempted.

RAMDOS might be of interest to non-disk users who might want to use part of the RAM as a "virtual disk" storage area. Within the limitation of the size of the individual programs and designated RAM, the program might fill the need of a disk-like addition.

(Dataman International, 420 Ferguson Ave. North, Hamilton, Ontario, Canada L8L 4Y9; cassette $25.95 U.S., plus 3 percent S/H, $2.50 minimum)

— Robert Foiles

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Super Disk Utility — A Collection Of Useful Tools

"Where is the beef.dat?" If you had used the Catalog option of *Super Disk Utility*, all that would be necessary would be to look down the printed list to learn where the "beef.dat" program was located.

Cataloging all of the files on all your disk is one of the nine operations grouped on the *Super Disk Utility* program sold by Petrocci Freelance Associates on an unprotected disk. The other operations supported are *Diskzap; Date Disk Files; Purge Files; Copy by Files; Directory Sort; Super Directory; Diskzap 40;* and *Track Formatter.*

The program author has arranged access to seven options through a main menu system. When a selection is entered it is loaded from the disk and automatically runs. The options have submenus to offer further functions. The other two programs on the disk *(Track Formatter* and *Diskzap 40)* are machine language programs that are loaded independently as needed.

From the main menu the user can select the drive number (0 to 3) for default drive. This option is very useful for the two drive user since it allows the program to move through the options without several disk swaps. The single drive user is given prompts as to when to switch disks (system disk or data disk) and switching disks is necessary each time a major option is selected.

Operating the Catalog option is simple for either single drive or two drives. The program prompts the user to enter a name for the disk which will have its directory read into memory. The disk is read and the next name is entered for the next disk, etc. When the user has run out of disks to read (or reaches the program's limit of 800 files) the hard part of the job is done. The sorting of all the disk directories into order by either "file name," "disk name" or by "extensions" is fast. The sorted file is automatically saved (with the program assigning the extension for each of the three types of sorts). For this review a total of 30 disks were read into the catalog. These disks produced 330 files which were sorted in less than one second. The sort routine is so fast that I had to run the test twice to be sure the sort actually took place. The only way to use the results of all this fast action is to have the listing of the sorted files printed out. Again, the selection of either "file name," "disk name," or "extension" is necessary for the printout of the records by that option. Once a catalog has been constructed, the program allows for modification by either deleting files or adding to the "inventory."

Diskzap, the other "major" program in the package has its own submenu. The options provide for "allocation table check," "verify disk sectors," "display file sectors," "display disk sectors," "move" or "copy disk sectors," "covert granule #" into track and sector or "zero disk sectors." During any of the display options, the program provides for modification of any location shown on screen by moving the cursor to the spot and typing over the desired notation. Once changes are made to suit the user, hitting ENTER will save that change to the disk. This section of the program works well and a change can be entered faster than some other "zap" programs.

The *Track Formatter* program is able to reformat any selected tracks (up to 40 tracks) on a disk with problems or it can format an entire disk. By using this program a not yet formatted disk can be given the same status as a disk given the *DSKINI* pass; but the program then will go back and verify all the tracks; and in a fraction of the time required to use the *DSKINI* function alone. Another feature of this program that may be of more interest to users of non-Radio Shack drives is that the "Sector Skip Factor" is controllable.

Diskzap 40, according to the program author, allows accesses to 40 tracks for those users not using Radio Shack equipment. This program was not tested since the system used for this review was standard Radio Shack equipment (which only has 37 tracks). The program also allows for a shifting of a copy of a disk's directory to track 37 as a "cash protection" option. Naturally, the directory restoration option is also included.

The 13-page manual covers the programs and indicates those areas where problems might occur. It is clear and easy to follow. Page 14, however, is printed in such a small print that it is almost unreadable; but it appears that page is the "End User Agreement."

The *Super Disk Utility* is a collection of some interesting and useful tools and some functions that may not be of interest to some users. The ability to purge files, copy or date a disk file, as well as the Directory Sort option which will read the directory, sort in alphabetical order or group by extensions and rewrite to disk, all from within the program, are there if you *want* them.

However, the Catalog option has a fast sort function; but there is no search or find function included. Thus, the speed of the sorting is outweighed by forcing the user to go to the slowest operation of the system — the printer — to make use of the information. There are other Catalog programs on the market which include a search function and sell for a fraction of the cost of this program.

This set of disk programs may appeal to some users as it is offered.

(Petrocci Freelance Associates, 651 N. Houghton Road, Tucson, AZ 85748, disk $29.95)

— Robert Foiles

One-Liner Contest Winner . . .

Guaranteed to drive you up the wall after a minute or so, this program draws a circle that gets larger and smaller over and over!

Michael Rosenberg
Prestonburg, KY

The listing:

```
0 PCLEAR8:FORX=1TO8:PMODE0,X:PCL
S:CIRCLE(128,96),X*10:NEXT:FORX=
1TO999999:FORY=1TO8:SOUNDY*20,1:
PMODE0,Y:SCREEN1,1:NEXTY:FORY=8T
O1STEP-1:SOUNDY*20,1:PMODE0,Y:SC
REEN1,1:NEXTY,X
```

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Adventure* and its companion *Rainbow Adventure Tape.*)

Star Trap Game Promotes Cooperation Among Children

Star Trap is a new and different game for one or two players aged seven or older. It is produced for Radio Shack by the Children's Computer Workshop — an activity of the Children's Television Workshop (the producers of *Sesame Street, the Electric Company,* and *3-2-1-Contact).* Supplied on cassette, this game requires Extended BASIC, and joysticks.

Before describing the game, I'd like to tell you how it differs from most games. First, this game teaches cooperation, rather than competition, when played by two children. The two players work together to accomplish the game's objective — to trap the computer-controlled star.

A second difference is the cassette format. Side one contains the "standard" game, ready to be loaded and played. Side two contains a modified version which allows the player(s) to "customize" the game via an easy-to-understand menu. Selections include the game (maze) size, background color, player and star speeds, active gates (explained below), and several miscellaneous options: the number of X's (used to trap the star), whether blockers are desired, the number of players, and the presence or absence of the maze walls.

The object of the game is to trap a single star — to block its movement either with X's (placed at the player's position when the joystick button is pressed) or by cornering it against a wall or between two players. The score depends on the time required to trap the star and the number of X's used — the shorter the time and the fewer the X's used, the higher the score. There are six gates which affect the players and star differently when passed through:

1) The X gate replenishes a player's limited supply of X's.
2) The speed gate increases the speed of the object passing through it — whether a player or the star.
3) The slow gate decreases the speed of the object passing through it.
4) The jump gate causes the object entering it to exit at a different location.
5) The invisible gate renders the star invisible for a short time after it passes through.
6) The magic gate allows the star to pass through walls for a short time.

When playing the customized version (on side two of the cassette), each of the gates can be included or excluded via the menu.

To further complicate play, blockers appear periodically at random locations for a brief period to block both star and player movement. (These blockers also can be included/excluded via the menu when playing the customized version.)

A detailed instruction book includes step-by-step procedures to assemble the necessary hardware, to load the program from cassette, and to play the game (using either the standard or customized versions). Possible difficulties and typical solutions are included throughout the book. All game symbols are explained and player strategies are outlined. The final pages suggest several related games that don't require a computer.

As you have probably inferred, I'm impressed with *Star Trap* — its unusual format, its cooperative nature, and its complete instructions. It encourages children to modify the game, possibly piquing an early interest in programming. Radio Shack has a winner in this game.

(Radio Shack stores nationwide, on cassette for $19.95)

— Jerry Oefelein

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One-Liner Contest Winner . . .

This is a very "graphic" demonstration of how things drawn in one *PMODE* look when switched to another.

Bill Valentine
Fort Worth, TX

The listing:

```
0 PMODE RND(5)-1,1:SCREEN1,1:X=R
ND(128):Y=RND(8):HW=RND(185)/99:
CIRCLE(126,96),X,Y,HW:PAINT(128,
96),Y,Y:GOTO 0
```

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Adventure* and its companion *Rainbow Adventure Tape.*)

Learning To Count With *Counting Things*

Two programs helping children learn to count and recognize numerals are presented on the tape, *Counting Things*. Instructions and guidelines for the parent or teacher are included as a separate, introductory program, which advises the adult to explain the programs first, demonstrate their operation, and pose questions which can be answered by using the programs.

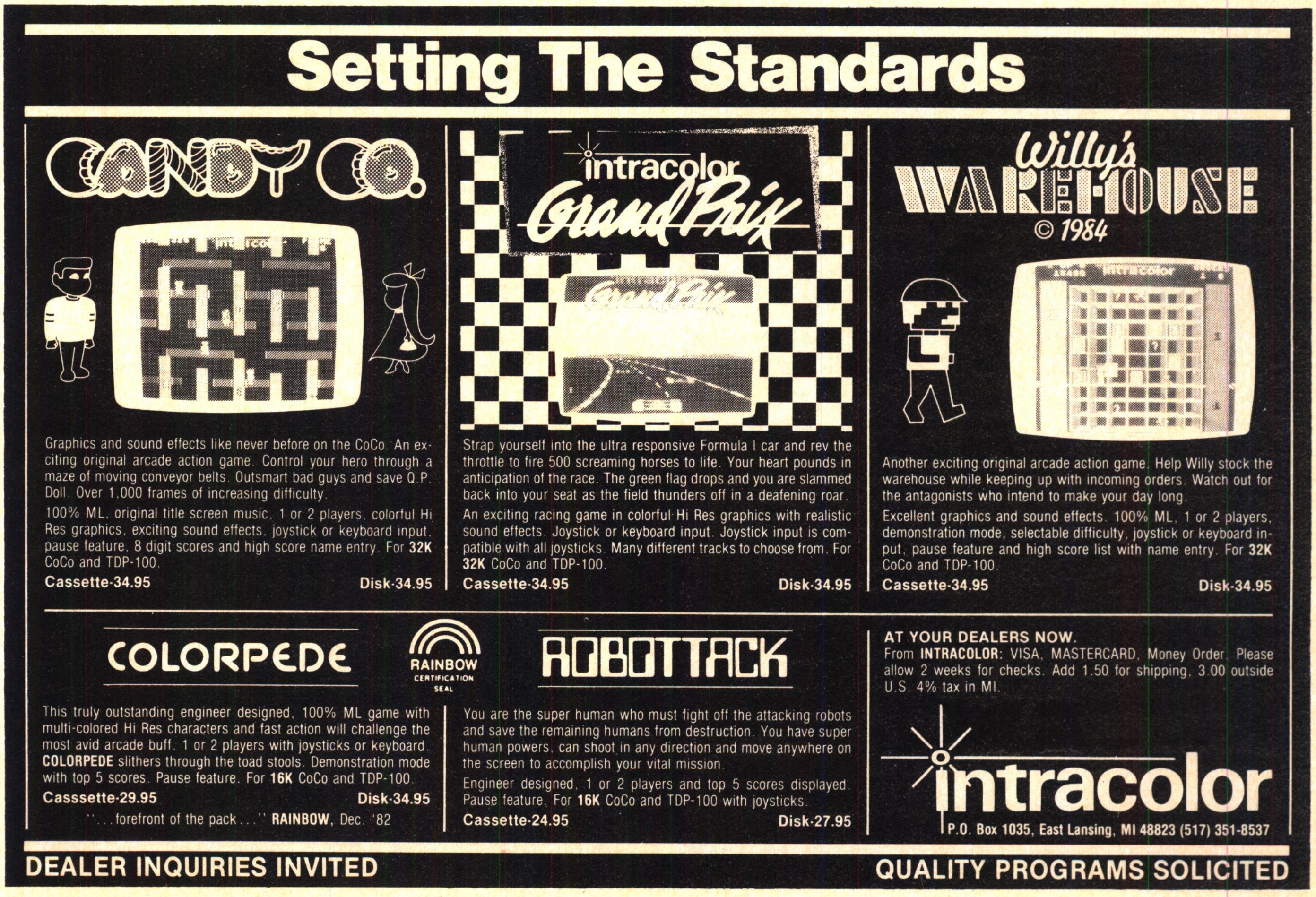
The first program, *Counting Things*, asks how far the child wishes to count and then goes to a Hi-Res screen showing three vertical lines labeled 100, 10 and 1 and, in the lower half, zero is spelled out and a 0 is shown on the screen. Under this, the computer asks, "What is the next number?" When the numeral one is pressed, the bottom portion of the screen shows the number one and spells out one, and, in the upper portion a plus appears and one small horizontal line is drawn on the vertical line in the units column. The program continues in this manner, adding lines to the units place, until the number 10 is reached, when a small line is placed in the tens column and the lines removed from the units column. This visualization of the number line, the place holding property of zero, and demonstration of how the number system works in moving from the units to tens to hundreds places is valuable, particularly if an adult has posed one of the suggested questions so that the child's attention is drawn to this feature of the program.

The second program is similar, although this time the child first enters how many numbers he knows and the computer then places numbers of pluses on the screen and draws corresponding numbers of small lines on the vertical lines, requiring the child to enter the numeral which the pluses represent. Both programs respond only to the correct number.

Thompson House wisely points out that these programs are not intended for repeated use to gain mastery, but rather to reinforce learning at various stages. At first the child learns to press the next number in the sequence, and becomes familiar with the written word for each number, then he counts objects and gains an understanding of the number line and perhaps some better understanding of the base 10 number system.

(Thompson House, P.O. Box 58, Kamloops, British Columbia V2C 5K3, 16K ECB tape $14.95)

— Carol Kueppers



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Cassette-34.95 **Disk-34.95**

Another exciting original arcade action game. Help Willy stock the warehouse while keeping up with incoming orders. Watch out for the antagonists who intend to make your day long.

Excellent graphics and sound effects. 100% ML, 1 or 2 players, demonstration mode, selectable difficulty, joystick or keyboard input, pause feature and high score list with name entry. For **32K** CoCo and TDP-100.

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Software Review

Pak-Panic — The Old Game With A New Twist

With centipedes, monsters, invisible mazes and ghosts that can go through walls, *Pak-Panic* from Tom Mix Software is unique compared to all of the competition. *Pak-Panic* is a 32K 100 percent machine language, arcade-style game that uses the left joystick and firebutton.

The scenario is as follows: You are Pakman. Your job is to go around the screen eating dots, power pills, and bonus prizes while avoiding monsters.

A power pill is one of the larger dots on the screen. Seven are on levels one through four. Six are on levels five through nine. When a power pill is eaten, Pakman has the power to eat all of the monsters he pleases. Whenever Pakman eats a monster, his ghost appears at the top of the screen. When seven ghosts have appeared at the top of the screen one of two things will happen. Either one of the ghosts will come out and float around the screen (even through the walls) hunting for Pakman, or the seven ghosts will link together to form a centipede that will do the same thing. Even with power pills, Pakman cannot overpower ghosts or centipedes.

Bonus prizes appear in the middle of the screen about twice a board. When bonus prizes are eaten they are stored in a box below the screen. When 14 prizes have been eaten you get a bonus of 14,000 points. This can only happen twice.

Four more tricks the programmer threw in to make the program better are invisible mazes every four rounds, the ability to store power pills, a selection of difficulty at the beginning of the game, and a high scores board.

You can store power pills by eating a pill while a previous pill is in effect. Stored power pills can be used by pushing your button while no power pill is in effect. A maximum of six power pills can be stored at any time.

I liked *Pak-Panic* and I think many other people will like it.

(Tom Mix Software, 4285 Bradford NE, Grand Rapids, MI 49506, tape $24.95, disk $27.95)

— Pat Downard

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Test Manager — A Useful Addition To Your School/Home Library

Test Manager is a program that allows you to create files of multiple-choice questions, then select specific questions to be printed on a test. An answer key is also printed with each test you prepare. *Test Manager* requires a 32K disk system with a printer. The program will work with one-disk drive with a minimum of fuss, but a two-disk system will make life easier if your files contain more than 75 questions. Question files can contain a maximum of 150 questions.

This program works exactly as described in the documentation. The documentation consists of six pages of information, clearly worded and neatly printed. The program worked without flaws for two weeks of rather intensive use. I made up a variety of tests, using all the options on the menu. One of the especially nice features of a program of this type is that it allows the teacher to create one set of questions (say 75) and then create five or six different versions of the test, each with its own key. This, of course, cuts way down on the chances for cheating, as well as allowing for individual differences in students or classes.

You begin by setting up your file of questions. Each question can be up to 245 characters long (I found this to be more than adequate.) A bracket is used on-screen to mark the end of the space allowed for a question, a very handy feature. If you do exceed the limit, the program tells you so, erases your question, and invites you to try again. Previously entered questions are not lost. After each question is entered, you enter the answers, correct answer first (the answers will be presented in true random order when each test is printed).

You can create true-false tests by just entering two answers and entering a blank for answers three and four. Answers can be up to 180 characters long. This allows for complete thoughts to be used rather than just one- or two-word answers. You may go back and add, delete or change questions later if you wish. The only restriction to this is that you cannot delete a question from a file containing more than 75 questions unless you are using a two-disk system. Both single and two-disk systems will hold a maximum of 150 questions in a file. You may also merge two different files together to make a new file.

Next, you select the questions you wish to use on a test. These can be from more than one file. The process of selection creates a new file of your selected questions, so you need to be careful not to try putting this new file on a nearly full disk — another place where two-disk systems make life easier! You then print out the test. You are asked for a name for the test, the form code (so you can match the correct key to the test), and the name of the file that will be used in printing. The program will also print a space for the student's name and class. You have the option of printing the questions in the order you selected them, or having the computer print them in random order. The answers are always printed in random order, even though you entered the correct answer first. The page break will always be between questions.

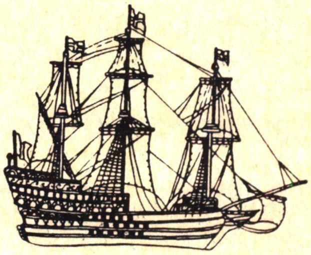
The printed copy of the test is neatly arranged, ready for photocopying. Or, since nearly all printers using friction-feed can print directly on a ditto master if the ribbon is removed before printing begins, you will have a letter-perfect test and no purple ink on your fingers! (See Valerie Rhead's article on Page 140 of the September issue of THE RAINBOW for a full discussion of this.) You have the option of single sheet printing (useful with the dittos) or continuous printing.

The only fault I found with *Test Manager* is that it isn't very economical with paper. Even with one line questions and one word answers, the most questions you can get on the first page is seven (eight on subsequent pages.) For long tests, you will have a number of pages to ditto or photocopy. If your printer supports a condensed-print mode, this may help. You could also ditto pages back to back, and some photocopy machines have this feature as well.

Overall, *Test Manager* is a well-developed program that does just what it claims to do. It would be a useful addition to your personal or school's software library.

(80 Custom Software, 5720 Brooke Lane, Sylvania, OH 34560, disk $29.95)

— Mark Williams



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The game requires at least a 32K computer and is compatible with either cassette or disc systems. Both versions are shipped on tape.

THE SPANISH ARMADA $24.95

Send check or money order to Picosoft Games, P.O. Box 35, Eighty Four, PA 15330; (412) 267-3721. Games are shipped postage paid. PA residents add 6% Tax. No delays for personal checks.

Key-Wiz — Easy, Fast, Useful Database Manager

Key-Wiz for 0S-9 is a simple, useful utility, especially for those who don't have the money for a $200 database software package. This program "is a multikey search utility designed to quickly search a file of index cards and find all entries which match a profile of keywords" and "logical operators such as AND, OR, and NOT to provide a very selective search criteria." This simply means it will find "entries" in a simple text file by searching for "phrases" or words you specify. An entry is nothing more than one to 60 lines of text 80 characters or less. Each entry is separated by a blank line and nothing more, so any 0S-9 utility that can create such a file, such as a word processor, can create your database.

Supplied with *Key-Wiz* is a sample database containing two lines per entry. The first line contains a book title and author, the second line contains a publisher's name. When invoked, *Key-Wiz* will present you with a menu of options. You can specify input and output files when you execute *Key-Wiz* or you can select the 'I' and 'O' menu options to specify those files after executing *Key-Wiz*. These assignments can be changed at any time while in the utility. Your output file is, by default, your screen and can be changed to a disk file, or perhaps to your printer. You can also select options to limit the search to any number of lines. For example, if you know the word(s) you are searching for are contained only in the first four lines, and each entry is 15 lines, you can tell *Key-Wiz* to search *only* the first four lines of each entry, thereby speeding up the search considerably. And *Key-Wiz is* quite fast, considering the work it must do. You can also limit the number of lines output for each match, thereby formatting your output to show only the data you wish to see. You may also tell *Key-Wiz* to display the output continuously or to pause after each entry displayed, waiting for you to press the ENTER key for the next entry. *Key-Wiz* also comes with *Sort-Wiz*, a quick sort utility designed to sort the entries on any line you choose. This is desirable for sorted output, and the standard OS-9 sort utility, if used, would sort the blank lines to the beginning of the file. This would destroy the entry markers in your file (the blank lines), hence *Sort-Wiz*.

I found one annoyance and one bug in this otherwise excellent utility. The annoyance is that there is a useless "Help" option, which does nothing more than redisplay the menu. Simply pressing ENTER does that already. It may make the program too large, but it would have been nice to have a brief "help" for each menu choice. The bug I found occurs like this: I've opened my input file and entered my search criteria. Entries which match are being displayed just fine. After seeing about 10 entries, I don't wish to see the remaining possible hundreds of matches. How do I stop the search? If I use BREAK, I interrupt the program completely and am dropped back to 0S-9. My CHD and CHX directories revert to bootup default! If I use CLEAR BREAK, the display continues, and when done, I see the menu constantly being redisplayed and it doesn't stop! The only thing I can do here is press BREAK and completely terminate the program! There is definitely a bug. There is an 'E'xit command in the menu which works perfectly, and even closes the files, but that is for "normal" completion.

Overall, for the price it is an excellent little database utility, again, for those who do not need or cannot afford the more expensive, though more powerful, database management software.

(Interactive Micro Systems, P.O. Box 21007, Columbus, OH 43221, disk $24.95)

— William Van Nest

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Howard Medical Disk System Offers More Storage

Many CoCo users are no doubt aware that several of the more popular personal computers (such as the IBM PC and PC*jr*, and Radio Shack's Model 1000, 1200 HD and 2000) use double-sided disk drives to cram twice as much data on each diskette by using the "other" side of the disk. All diskettes that I know of have a magnetic coating on both sides (unlike recording tape, which is almost always single-sided), but so-called "single-sided" disks are only guaranteed to work on one side. In practice, single-sided blank diskettes generally work fine with double-sided drives. Howard Medical's *Drive 0 Package* lets you get up to 360K on a single diskette on the CoCo, and is also able to handle standard CoCo disks.

The *Drive 0 Package* consists of a DD-2 double-sided disk drive (with case and power supply) and a J&M Systems disk controller. A special cable is also included. The disk drive is a TEAC half-height unit, the same one used in the Sanyo MBC-550-2/555-2. Its case is sturdy, though plain, and the power supply is well able to drive it.

The JDOS operating system supplied with the controller is the key to using double-sided drives on the system. It is capable of using either 35 or 40 tracks and either one or both sides. The J&M controller is also configured for double-sided drives. All you have to do is format your disks on both sides in the J&M format, like this:

```
DSKINI 0, 2, 40
```

Disks formatted in this way will have 360K of space available. JDOS automatically adjusts for the format of whatever disk you use, including standard Radio Shack disks.

One problem with using JDOS is that a few programs (such as *Telewriter-64)* are very dependent on Radio Shack Disk BASIC features and won't run with the entirely different JDOS ROM. If you have a Radio Shack disk controller, you can use it with the new drive with no problem (but only on Radio Shack-format disks). If you have 64K, another way would be to use the SYS SAVE and SYSTEM programs in Part I of "Cooking With CoCo" (August 1984, Page 18) to save Radio Shack Disk BASIC on a special disk and use it in place of JDOS if needed.

If you think that 360K per disk will help you use the CoCo more effectively, the *Drive 0 Package* is a good buy.

(Howard Medical Computers, Box 2, Chicago, IL 60690, $395 plus $7 S/H)

— Ray Edwards

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Calorie Counter — Weight Analyzer Is Just What The Doctor Ordered

Draco Software's *Calorie Counter — Weight Analyzer* program is just what the doctor ordered. This tape-based program offers a well-rounded choice of over 400 food items to use in daily menu planning, with guidelines given on how best to plan your diet program.

A seven-page guide and instruction booklet outlines the basics to allow the user to lay out a regular, well-balanced diet for children, teens, adult males, adult females and lactating females. All that is missing is a guide for pregnant females, and perhaps it is intended that, in such cases, direct medical supervision of diet is called for.

Once the program is *CLOADed*, *RUNning* should get you going. (I have an older CoCo with the *PCLEAR* problem, and so had to type *RUN* twice.) A brief quiz allows the computer to determine your correct weight, and displays it on the screen. You should make note of this, as you will need it later when compiling your daily food selection. Something that might be done in a future edition of the program is to check if a machine is 64K and if so, *POKE* the maintenance calorie level into high RAM. Then when the next section is loaded, it could check and *PEEK* the information into the program, to be displayed for reference. A minor point is that age is not considered in determining the calorie level needed to maintain body weight. While the difference may not be great, a 20-year-old of a given size and weight will burn more calories than an equivalent 50-year-old.

A very few items needed further clarification of serving size (chef salad, raw carrot) but in almost all other cases the serving is given in standard cup or ounce increments.

The ability to store a daily menu on tape for future use allows the user to build a "file" of menus which, with a little planning, would allow a dieter to plan a varied meal plan and cut down on those moments of indecision which might otherwise lead to the kind of snacking that can lay the rest of a day's good intentions to waste.

A nice option, should you succumb to temptation, or if you have a food not on the listing provided by *Calorie Counter*, is one which allows you to enter an extra calorie amount. This allows you to account for (my favorite) ice tea with extra sugar, or other personal foibles.

A printer option gives the user a hard copy to keep by your refrigerator or to take to the store. This can help reduce nibbling, as well as cut down on impulse buying.

Both fun and (sometimes) depressing to use, Draco's *Calorie Counter* should prove a good buy for any dieter.

(Draco Software, 22 Cassell Street, Portland, ME 04102, $29.95)

— Nevin J. Templin

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Talking Adventure Starter — A Vocal Experience For Adventurers

By Kenneth D. Peters

Welcome to Adventuring with voice responses! *Talking Adventure Starter Package* by Owls Nest Software consists of two Adventures, *MYHOUSE* and *PIRATES,* and a two-page documentation designed to help teach Adventuring to the beginning Adventurer while providing the unique experience of vocal responses throughout the Adventures. As an added attraction, these Adventures are relatively simple, nonviolent, and fun; suitable for very young children of reading age.

Owls Nest has two versions of the *Adventure Starter Package.* The standard version was reviewed in the February '84 RAINBOW and has only a text response. The *Talking Adventure Starter* is meant to be used with Colorware's *Real Talker* voice pak, introducing you to Adventures with the added realism of voice responses.

The reviewer of the standard *Adventure Starter* mentioned having to remove the disk controller and enter *PCLEAR 0.* If that was a problem then, apparently both conditions have been improved. I found both Adventures in the talking starter package loaded with a simple *CLOADM* operating under Disk BASIC. The actual Adventures are written in BASIC, but use *CLOADM* to load and auto execute and also to provide an initial screen to read while the Adventure loads.

I was disappointed by the lack of an introductory voice when the Adventures first begin. In *MYHOUSE,* you are given an Adventure welcome (in text form), with the object of the Adventure being to find the hidden golden coin and return to the front porch. (First you must find a way to enter the house.) I anxiously waited for a voice to come forth and welcome me while I was trying to decide what to do. None came. "Where's the voice? I thought this was a talking Adventure." My initial disappointment passed as I progressed through the Adventure. With increasing interest and enthusiasm I discovered that the voice pak was used primarily for responses to the Adventurer's commands: East, West, North, South, Help, Get Paper, etc. Actually, my kids and I found that the voice talked to us quite often as we explored the house using one- or two-word commands, such as "Open Door" and "Read Paper". Moving through the house by entering compass directions (N,S,E,W) and Up and Down sometimes provoked a vocal response. Sometimes the Adventure voice provided us with a humorous response to our commands and movements. Sometimes it gave us some useful clues. Overall, use of the voice pak gave us a remarkable experience not to be soon forgotten.

One thing about the Adventure that bothered me was the slow character print on the text screen. *MYHOUSE* has a poke in it that reduces the character printing rate across the screen. I found it annoying to have to wait so long to see what the response and changes were on the updated screen. However, I am not a beginner in Adventures and after thinking about it, I realized that

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feature could be a big plus in helping draw the attention of beginners to screen updates and the fact that changes may have taken place as a result of something they just did, but may not be obvious unless they actively look and review their surroundings. In *PIRATES,* the poke has been modified so the screen is updated much faster. (Being written in BASIC, both Adventures can be altered to delete the poke if desired.)

Lack of a vocal welcome and the slow screen update are minor. I think the *Talking Adventure Starter Package* does a super job of developing an interest in Adventure game playing and in providing the beginning Adventurer with many detailed hints, clues, and ideas about playing Adventure games. I watched my two older children, ages seven and 10, play *MYHOUSE* with the same engrossing and endless enthusiasm as they play the arcade quality games on the CoCo.

In addition to the excellent documentation containing all the helpful hints and ideas, both Adventures use the HELP command. HELP is used extensively in the first Adventure, *MYHOUSE.* Typing HELP invokes a vocal response ranging from giving you moral support to suggesting new ideas to try or things to look for, to telling you simply that nothing will help you here. *MYHOUSE* is relatively simple, meaning there are few rooms, movements, and obstacles to overcome and contains no death traps. Additionally, *MYHOUSE* is similar to your house and mine — a setting we all have some familiarity with. In the eyes of a child or beginning Adventurer no Adventure may seem simple at first. I found *MYHOUSE* quite enjoyable and it introduces the basics of Adventuring very nicely.

PIRATES is also relatively simple, when compared to other complex Adventures that take days and weeks to complete. There are relatively few moves (rooms/scenes) in *PIRATES* and they are easily mapped out. But *PIRATES* is much more involved and complex than *MYHOUSE,* and contains several death traps. Your goal in *PIRATES* is to recover the pirate's treasure. *PIRATES* introduces a greater depth and exposure to the subtle ideas, increased number and variety of verbs, the importance of doing the right thing at the right time, and the persistence needed at times to obtain a desired result and finish an Adventure.

Both Adventures have a game save feature. I used the option in both Adventures to make sure it worked; however, some Adventurers may find they do not need it. I finished *MYHOUSE* Adventure within an hour. My children both finished it within a half-dozen sittings (one-half hour to one hour per sitting). *PIRATES* took considerably longer but is possible to complete in one evening unless you really get stuck.

I thoroughly enjoyed both Adventures. I keep reading or hearing about many people who get discouraged and frustrated by Adventures and give up or lose interest. I believe both programs and the accompanying documentation provide enough help and foster sufficient interest to ward off such feelings. At the very least, *Talking Adventure Starter* would probably give the unsure beginning Adventure player a truer feeling for what Adventuring is about and an opportunity to enjoy and learn more about Adventuring.

If you've been contemplating Adventures or if you've tried Adventures and have become frustrated with them, I would recommend giving *Talking Adventure Starter* a chance. I also would highly recommend the *Adventure Starter* as an ideal nonviolent Adventure for young children, age six and up (reading age). The children love it and you might even consider a joint parent-child partnership in solving the Adventures. Even if you are beyond the beginner's level, I think you'll find these two Adventures enjoyable. Both are possible to finish in an evening and both will give you a unique vocal experience. By the way, if you don't have Colorware's *Real Talker*, the standard text *Adventure Starter* is also available.

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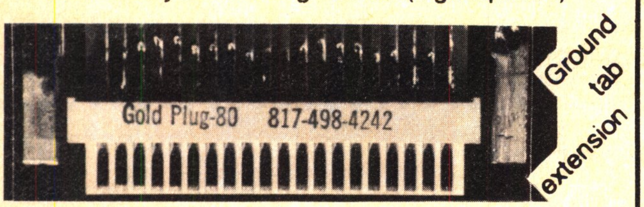

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Play With Language Is Exhilarating, Entertaining And Educational

By Michael F. Garozzo

It is hard to believe how far computers have developed in the world of education. After all, it's not *that* long ago I attended school. Actually, of course, education is an ongoing experience, and we all are continually learning how much we do not know. But I certainly do not remember school being as much fun without computer programs like CCW's *Play With Language.*

Children's Computer Workshop, in case you do not know, is part of Children's Television Workshop, the group who produced *Sesame Street* and developed Sesame Place, the educational amusement park in Pennsylvania. As a matter of fact, the computer programs that CTW developed were originated at Sesame Place. Living about 10 minutes from Sesame Place, I can verify the statement in the introduction of the booklet that says, "Fifty-seven computer games are available . . .," my children and I have played most of them.

I think the three programs included in *Play With Language,* developed from the low-resolution, fairly simple games at the Park, are amazing. The 35 people listed under the titles of CCW's print development team and software development team deserve the credit for a job well done and I feel that it was honorable of CCW to list their names.

Play With Language is designed for elementary school use. This is not to say a family would not profit from the learning experiences; however, the format of the instruction booklet is definitely classroom oriented. The information begins by telling you that the program includes three language-arts learning modules. Each learning module contains the diskette, 10 reproducible worksheets, five activity cards, one gameboard and one poster describing how to play the activity. An extensive teaching guide states ". . . and ancillary materials to provide for individualization of instruction, child/computer/teacher interaction and an educational philosophy which encourages active participation in reading and writing." And this was in the first paragraph. Does this scare you? Would Cookie Monster refuse a chocolate chip cookie? The general information section begins with the word "Relax." The booklet is designed for the beginning computer user as well as the more experienced. The instructions are precise (and so easy to follow that Oscar the Grouch could not get mad). And in case you just unpacked your Color Computer for the first time, "Setting Up Your System" describes everything you need to know right down to which wire to plug into what connection.

The three, separate programs with the *Play With Language* series are: *Picture Place!, Roll-A-Word,* and my personal favorite, *Bagasaurus.* According to the instruction booklet all programs have the same affective and cognitive goals.

The affective goals are:

A) Students talk and exchange ideas with their peers and teacher as they interact with the computer.

B) Students are involved in self-directed learning as they explore environments and think about information in new and different ways.

C) Students have fun and enjoy their experiences with the computer, as they play the activity.

The cognitive goals are:

A) Students practice sight words and beginning vocabulary as they exchange words and their picture referents.

B) Students practice making words in rhyme patterns and complete sentences in clever ways.

C) Students practice several reading comprehension skills and create stories.

In addition, each program has an individualizing menu for the teacher called "Learning Manager"; a "Teaching Extensions" section in the booklet for additional classroom activities; a stand-alone "Gameboard" to use in the classroom with a group; and a "Dictionary" that lists all words in the program.

Picture Place! has 193 word-pictures and six background scenes. Each time the game is played, " . . . the computer randomly selects 24 words from a pool of 40 words associated with the chosen background scene." The student picks a word from a list of four words shown, hits the ENTER key, and using the joystick, moves the word-picture onto the scene. When the student feels that the proper location has been reached, the ENTER key is hit again and the word-picture is placed upon that spot. The bottom of the screen has a list of four words, the word "more" and the word "end." The joystick glides a rectangle across

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the screen for placement of the words on the scene or encircles individual words on the list to be chosen. When you encircle "more" you get the next list of words, if you encircle "end" you stop the program. It should be noted that the description I am giving you does not give justice to the excellent high-resolution stage scenes or to the superb machine language music used in the program. *Picture Place!* is designed so the teacher can develop special skills with short vowels, long vowels, blends, the silent 'e' rule and syllables. As with all the programs, the teachers can create their own lessons by choosing certain picture-words and saving them to a disk. Of course, the teacher can save each student's creation on a separate disk. As before, the instruction booklet is very precise in explaining each and every step. The "Teaching Extensions" section includes 10 activities that correlate with the program. In addition, there are five activity cards for the students. Each activity card is a 5" x 7" hard, glossy card that is designed to withstand classroom use. The "Gameboard" is a Monopoly-style game that is printed on glossy paper. It would probably be worthwhile to glue it down to a piece of cardboard for permanent use. Complete instructions are included in the booklet. The 10 reproducible handouts include a cartoon (for coloring), questions and an activity.

Roll-A-Word is a fascinating way to have students match beginning and ending sounds. The more complex version has the students using blends. A sentence is shown with blank spaces. By using the right and left arrows, pictures are moved across the top of the screen. When the student reaches a picture that matches the sentence, he uses the up and down arrows to roll the letters in the rectangle. Upon matching the letters to the proper picture the student hits the ENTER key. If correct, the picture either rides, flies or floats to the correct position on the sentence. If incorrect, he has to continue. It is as much fun rolling the letters and pictures as it is getting the right answer. As before, the program has a learning manager so the teacher can create other versions of the program. Student sentences can be saved to disk if desired.

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There are also 10 "Teaching Extensions," five activity cards, and a gameboard. The *Roll-A-Word* dictionary is divided into word groups such as: "UG"; "bug, jug, rug, mug, plug".

I have never met such a lovable creature as *Bagasaurus* (or my subtile, "Heigh-Ho Din-O-saur"). In case you have never heard of a Bagasaurus, a short story describes that 100,000,000 years ago, when the ice age came, all the dinosaurs died off, except that one dinosaur egg (put in a blue paper bag by its parents) was saved! I am not one who ruins the great story by giving away the ending so you will just have to read the rest yourself. I will tell you that *Bagasaurus* travels around the world (in fantastic high resolution pictures) from Easter Island to Egypt and along the way he has to bag (as in *Bagasaurus*) words and images by correctly answering questions. The student uses the joystick to move and the ENTER key to collect the words. If incorrect, the Bagasaurus stomps his (I use the word "his" carefully as it may be "her" and I do not want a dinosaur to get mad at me) feet and shakes its head no. If correct he/she nods yes and takes the word or image. Sound effects are great! Each footstep, closer or further away, can be distinguished. Each nod, positive or negative, is different. Each screen provided a little different type of sound. "Heigh-Ho Din-O-saur!" There are 13 different scenes, 100 questions, 70 images, and 300 words. After correctly choosing a word or image to a question (*Bagasaurus* does not move on until you answer correctly) all chosen words are fitted into one of 50 different stories or poems. Throughout the story are underlined words and by hitting the ENTER key the student changes the story word with the word they chose with *Bagasaurus*. Vocabulary skills are developed with synonyms, antonyms, and multiple word meanings. Reading comprehension skills include classification, following directions and sequencing. Of course, there are 10 "Teaching Extensions," five activity cards, a "Bagasaurus Gameboard" and a dictionary. High-resolution graphics abound.

Something I did not mention about all these games; they are all non-resident. The disk must be connected all the time and the effect is excellent. All high-resolution pictures flow from one into the other. The music blends with the scene. Everything works perfectly.

With all I have written I bet you're wondering if I tried it out on some children. Of course, I let my children work with it. And yes, I sat back and observed their motivation and educational achievement and *yes, it does what it says!* My children, Jennifer, David and Michael loved it! They cooperated together in developing the programs, they learned the blends in *Roll-A-Word,* they made stories with *Picture Place!*, and they had *Bagasaurus* travel around the world to collect words and most important of all . . . they let me play with them.

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Jungle Queen Seeks A Safari Hero

If real men don't eat quiche, it's just as unfortunate that real cannibals do eat people, and right now a group of them is adding a few vegetables, some garlic, and a little Accent to a stewpot of water rapidly heating up over a well-stoked fire. In the pot of water is our Jungle Queen, and if she is not rescued soon she will become a tasty dinner for the hungry cannibals.

But wait! In the distance a hunter on safari hears the Queen's cries for help. The area of jungle he is in is nearly impassable, so he leaps for a vine and swings from tree to tree, Tarzan-style. Suddenly the trees end and our hero encounters an alligator-infested river. He must swim across the river, avoiding and killing the alligators as he swims. He must also avoid large clusters of bubbles which can entrap him and limit his maneuverability, making him more susceptible to the hungry 'gators.

Once across the river, our hero is getting very close to the cannibal village. Some of the cannibals have discovered his presence and are rolling rocks and boulders at him as he attempts to climb the hill where they are cooking the Queen. After ducking and jumping the rolling and bouncing rocks, our intrepid rescuer arrives at the scene of the cookout where, in two mighty leaps, he jumps over the heads of the cannibal cooks and rescues his beloved Queen (clap and cheer loudly!).

Jungle Queen, by Dave Shipka of ZOSO Software, is a good rendering of the arcade game *Jungle Hunt*. It has four screens; the swinging vines, the river crossing, the rolling stones and boulders, and the rescue of the Queen in the cannibals' cook pot. In higher levels, the swinging vines have monkeys on them trying to knock the hero off the vines. While the graphics do not set a new standard for excellence as did games like *Zaxxon* and *Pyramid Adventure*, they are good. My staff of assistant reviewers (three teen-aged sons and their friends) rated this as a good game and fun to play.

When I first received this game for review, I found that the tape did not stop running when the game was loaded. I also found an oversight in the documentation — it did not specify how to move the man through the screens, whether to use the joystick or the keyboard. I wrote to Dave Shipka about the problems, and in a few days a new tape and revised documentation arrived in the mail with both problems corrected. It looks like the buyer can expect good, prompt support in case of any problem.

The program is extremely long — it requires full 32K, so if you have a disk drive, by all means order the disk version.

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— James G. Kriz

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Turn Of The Screw Correction

In Tony DiStefano's column in the December 1984 RAINBOW, the last sentence on Page 28 is incorrect. It should read: "Next, take a little piece of wire and jumper Pin 20 to pins 2, 5, 6, 9, 12, 15, 16, and 19 — one at a time." Our thanks to Rodney Masten, of Macon, Mo., for catching this.

Additionally, the BASIC listing Tony mentions as an example program was inadvertently left out. The following routine will run four lights in a chase sequence. Use the up and down arrows to increase and decrease the speed of the chase:

```
160 POKE&HFF40,1:GOSUB 250:POKE&
HFF40,2:GOSUB 250:POKE&HFF40,4:G
OSUB 250:POKE&HFF40,8:GOSUB 250:
GOTO 160
250 A$=INKEY$:IF PEEK(341)=247 T
HEN X=X+1ELSEIF PEEK(342)=247 TH
EN X=ABS(X-1)
280 FOR I=0 TO X : NEXT I:RETURN
```

The line below will turn four lights on and off randomly. Change (16) to (255) for an eight-light system.

```
380 POKE&HFF40,RND(16) : SOUND R
ND(100)+100,RND(5) : GOTO 380
```

Key Tronic Keyboard Among The Best

Even though Radio Shack has introduced a "real" keyboard on the CoCos made over the past few months, there still seems to be quite a bit of action on the replacement keyboard front. For one thing, there are still hundreds of thousands of older models in use, and they won't go away very quickly.

Key Tronic's KB-500 is a fairly recent entry into the field. It has some good features, but also some drawbacks compared with some other keyboards. Like most of the other replacement keyboards, this one is made by one of the major keyswitch manufacturers; Key Tronic makes keyboards for many of the IBM-compatible computers and a number of other systems as well, and they are probably best known for the replacement keyboards they sell for the IBM PC and PC*jr* systems.

The Key Tronic keyboard installs easily; it's not as easy to do as the Macrotron or Radio Shack units, since you have to cut off the center post, but like them (and unlike the HJL-57 and Mark Data Super Pro) it drops right onto the existing mounting posts just like the old keyboard did. The KB-500 comes with the "F board adapter" to plug into newer CoCos' keyboard sockets, and it works on all models including the CoCo 2. The instructions are reasonably clear and should cause no problem.

The KB-500 is quite similar to many of the "IBM clone" keyboards in that its keys are the same size and shape as the PC's keys and feel much the same, but without the characteristic "Selectric click" of the IBM PC keyboard. The layout is identical to that of the normal CoCo keyboard except that one function key has been added, in contrast to the four you get on an HJL or Macrotron unit. This key acts as PF1 if you are using software designed for either of those keyboards.

One interesting aspect of the Key Tronic keyboard's design is that it seems to be geared toward the person who mostly uses programs in BASIC. The specialized shifted-key functions (caps lock, pause, delete line and brackets) are now marked on the keys themselves. (Radio Shack has been using SHIFT-0 as the caps lock key on the Model I and III as well as the CoCo for the past five years, but none of the machines has the key marked to indicate it.) Also, the BREAK and CLEAR keys — the two that will wipe out the program line you were typing — have heavier springs under them to keep them from being pressed accidentally. While this is great for BASIC, application programs will often use those keys for special purposes (*Telewriter* uses BREAK to delete characters and CLEAR for special editing functions), so you may have minor problems. It might be a good idea if Key Tronic would put two extra normal springs in the package so those who want to can restore either or both of those keys to normal and even protect other keys, if desired.

The only actual minus points I found (aside from the dull color scheme of gray alphanumeric keys and dark gray control keys) were the way the keytops stuck up from the surface, leaving a gap of about $^3/_{16}$-inch, and that Key Tronic copied the rather silly IBM practice of putting a small keytop in a large space with a "skirt" covering up the gaps (on the KB-500 the ENTER key is the only one so treated). I'd just as soon have a key that takes up the full space.

The Key Tronic KB-500 is a decent replacement for the CoCo's original keyboard, even if you have the new Radio Shack keyboard in your machine already. As I've said before, since the computer keyboard is such a personal thing, you might want to look at as many of the various replacements as you can before making your choice.

(Spectrum Projects Inc., Box 21272, Woodhaven, NY 11421, or Box 9866, San Jose, CA 95157-0866, $89.95 plus $3 S/H)

— Ed Ellers

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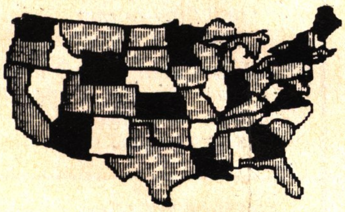

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Semigraphics Support Combines Text And Graphics

By T. Gray

One drawback to the Color Computer is the difficulty of combining text and graphics. One way around this difficulty is *Semigraphics Support* (SGS) by Micro Computer Systems. This machine language programming utility meshes with Extended Color BASIC to provide medium-resolution graphics in nine colors plus black.

The result? You have 17 new commands and four new functions. You have easy access to single-bit and six-bit sound generation. You can use five new, full-color graphics modes, with Extended BASIC commands to draw circles, squares, and lines, fill them in, move them around, create animation, and label graphics with text.

There are a lot of good things on this disk (or tape). There are demonstration programs for 16K and 32K. These are interesting enough that I watched them through a couple of times before I even tackled the main program. The demos give you a good idea of what the program can do.

The "new" semigraphics modes are already in your CoCo, and are discussed in Section IV of *Getting Started With Color BASIC*. They provide resolutions from 32 x 16 (SG4 or alphanumeric internal, which CoCo normally uses to put letters onscreen) to 64 x 192 (SG24). In order to access these modes, it is usually necessary to do a lot of *PEEKing* and *POKEing* around. Fortunately for me, *SGS* does not require an understanding of the hardware and its quirks.

The graphics commands are sensible, easy to remember, and similar in syntax to those of Extended BASIC. All are distinguished by a preceding 'S.' For example, SPIXL(x,y,c) sets a pixel located at (x,y) to color (c). The function A = SPIXT(x,y) is a pixel test; it returns the value (zero to eight) of the color of pixel (x,y). So much of this is familiar that—after you have spent a few hours puzzling it out—it is easy to use. There is SCIRCL for circles and ellipses. There is SLIN for lines and boxes (solid, dotted, and dashed) and for solid boxes. There is SFILL to paint, and SHIFT for easy simple animation. You can SKOPY one graphics page to another, or SMOVE graphics around the page.

The sound routines are just as handy. STONEA(f,e) gives you control over the single-bit sound routine. You can set the frequency delay (f) and the envelope delay (e). STONEB (f,e,v) gets you into the six-bit sound, where you can control the volume (v) as well. These two tones aren't as easy as PLAY but are fun to play with.

In fact, the author of the documentation seems determined to force you to play around in order to learn how to use the system. I'm not saying that the documentation is inadequate. The manual was nicely done and spiral bound. (It did what spiral bindings always do: it uncurled and dumped pages all over the floor. If looseleaf binders are too expensive to include in the package, just punch holes in the pages and I'll buy my own binder, thank you.)

No, the information is there, but the entire manual seems a bit backward. The full description of how to load

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the thing into various CoCos is found at the back. At the front is an incomprehensible command summary. As I worked through the commands, I kept running into other commands and terms that had not been previously covered. This made the concepts a little hard to pick up. By the time I had worked through the manual, the command summary wasn't quite so incomprehensible, but it shouldn't be one of the first things a user trips over. It was this aspect of the manual that made the program a bit hard to get involved with.

A nice feature of the manual is that there are dozens of sample programs showing you how to use the various commands and features of the program. Even those impressive demonstration programs are listed! Not only do these help you learn the system, they are a treasure trove of information that is missing from the main sections of the text. You pass over these sample programs at your peril.

For example, you can save your semigraphics pages to cassette or disk as ML programs. This is an important feature of the system that really should be given a main section in the manual. Instead, it sneaks into a sample program somewhere toward the back few pages.

One of the main selling features of the system is the ability to easily combine text with colorful medium-resolution graphics. It delivers, too, in three styles of text (orange, green, and inverse, the same as ECB). The graphics mode for which this is available is of about the same quality as set/reset graphics, but is far easier to use. This important feature is not even mentioned in the manual. It is hidden in one of the sample programs, waiting for you to discover it. The actual method of locating letters on the screen, while not difficult, is far from clear in the sample program.

It will take you a bit of experimenting to sort everything out. This is all well and good, if you have the time. I'm sure it wasn't the author's intention to play guessing games with the user, but that's the way it comes out.

In addition to the major omissions of saving graphics and combining text with graphics, there were some minor missing pieces. I'd have appreciated having a few tables that weren't in the text:

1) summary of the commands and their syntax (the commands are summarized, but the syntax is buried in individual sections of text);
2) table of the maximum x and y values in each mode;
3) color code would be handy (it's the same as Color BASIC — 1=green, 2=yellow, etc. but I haven't memorized them);
4) since some commands are not available in some modes, a chart of this would be useful.

So there it is, a semigraphics support system that extends your Extended BASIC. Should you buy it? Well, it is easy to use once you get the hang of it. It does increase your capabilities when programming in BASIC. If you incorporate it into a program for sale, there is no license fee. It works with 16K, 32K, cassette, and disk. It comes with a pile of sample programs to help you get to know it better. It encourages, or insists on, exploration and experimentation.

(Micro Computer Systems, 1404 Sunset Drive, Friendswood, TX 77546, 16-32K ECB, cassette $29.95, disk $34.95)

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Explore The Universe And Rescue The Earth In *Trekboer*

There's a deadly virus threatening the future of humankind in *Trekboer* — a new graphics Adventure by Mark Data Products — and your mission is to search the universe for a cure.

You are aboard the spaceship Trekboer as the Adventure begins, with a variety of buttons to push, doors to open, rooms to search, objects to collect, a tracking screen to watch and a robot that you will need to help you.

As in other Mark Data graphics Adventures, such as *Calixto Island, Sea Search* and *Shenanigans*, the visual effects in *Trekboer* are top-notch and of such quality that you will find yourself (again) in front of the computer during the early morning hours.

You have four planets to explore in your journey, each with its own unique environment and the inherent dangers you've come to expect from Adventure games. Be forewarned that you should be braced for some shocking discoveries because the virus has been claiming many lives.

You will need to watch your diet, too, until you discover how the disease is being transmitted. You will probably get thirsty along the way, but it's a good idea to have any liquids tested before indulging yourself.

If you find yourself in danger of being wiped out, or if it's just time to call it an evening, a SAVE feature allows you to retain the game at any point for later resumption. There's also a HELP feature, which I found to be of questionable value because it usually repeats advice given earlier. Directional commands are simplified by allowing you to enter the first letter of the direction in which you want to proceed.

Mark Data has graciously provided maps and telecommunications aids, but first you will have to find them and, secondly, figure how they can best serve you. There is, of course, some guesswork involved, a lot of false starts, and logical steps that must be taken before you can utilize them.

You must be diligent in your search because there's no turning back to the home base unless you're willing to sacrifice your pride and/or the game. After all, the entire universe is counting upon you!

One of my first reactions was to the name of the Adventure game. Why in the world would the United States want to name a spaceship Trekboer? After thinking about it for a while, it occurs to one that the name could be a clue to the solution of the Adventure. Even then, you've got a way to go before reaching a satisfactory conclusion.

Like most Mark Data products I have experienced, *Trekboer* demonstrates the full potential of the Color Computer. The game is challenging, the options are many, the plot is sophisticated, the graphics exceptional, and the appeal is universal. If you're into Adventures, especially of the graphics variety, *Trekboer* is for you.

(Mark Data Products, 24001 Alicia Parkway, No. 207, Mission Viejo, CA 92691, tape $24.95, disk $27.95.)

— Charles Springer

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Speed Racer Offers Good Challenge For The Racing Enthusiast

Just when you thought the Color Computer had reached its full graphics' potential, along comes a program like MichTron's *Speed Racer* that makes you wonder just how much more we can extract from this incredible machine.

As you climb into the driver's seat, you are greeted by an opening screen that includes a CoCo and monitor (with motion picture-type credits) on a red and black checkerboard field. You know then and there you are in for something special.

You have a choice of four racecourses, ranging from the predictable rectangular shape to an S-shaped track, and others with a never-ending variety of hairpin turns and tempting straightaways.

You're off with a wave of a checkered flag! Just push your gearshift (right joystick) forward and you're rapidly pushing 200 miles per hour in the age-old quest for glory. Your speed is indicated in a nicely composed speedometer at the lower left of the screen. The object of *Speed Racer* is to pass the required number of cars for each lap, which is indicated by an arrow under a 'Cars Passed' marker at the lower right. You must reach this goal to progress to the next lap. Otherwise, the game is over. Complete all five laps (10 miles) and you win the race.

The real hazards of racing, of course, are the other cars in the race. You must manage to pass them without colliding or losing control, or you will be the latest fatality. Collisions are dramatically represented on the screen by a cloud of smoke and flying tires.

The competition is represented in true arcade fashion that rivals one of those packaged in a sit-down booth at the local video gathering place. It is the game that many CoCo lovers have envied for many months, secretly hoping that it would become available to us.

The action in *Speed Racer* is not quite as furious as the one in the arcade — you won't be running through any billboads, for example — but the level of challenge would rate an eight on a scale of one to 10. There are road signs, however, which warn you of impending curves ahead. If you hug the curve for too long, you'll probably blow a tire. That's the cue for the pit crew to show its speed in replacing them, an interesting spectacle.

There are separate high-score capabilities for each track for up to 10 games. The track is selected by moving the joystick from left to right.

The scenery in *Speed Racer* is as distracting as it is beautiful, ranging from big city skylines and mountain ranges to ocean scenes, complete with sailboats. One of my favorites is the one that includes a giant suspension bridge. Some people I know play the game as much for the scenery as for the thrills of racing.

The graphics in this game are as good as I've seen on any computer, without question. Let's hope this is one of many more to come from MichTron. This effort is indicative, I hope, of an even stronger emphasis on quality in what could be a whole new era of arcade games for the Color Computer.

(MichTron, 576 S. Telegraph Road, Pontiac, MI. 48053, cassette $34.95, disk $34.95)

— Charles Springer

One-Liner Contest Winner . . .

This one-liner is best described as "Old Glory the easy way." It's a surprisingly good (for one line) reproduction of the Stars and Stripes.

Ronald W. Wilson
Franklin, OH

The listing:

```
1 PMODE1:PCLS:SCREEN1,0:DRAW"BM0
,0R255D99L255U99BR50D50L50BU40BR
50R205D10L205D10R205D10L205D10R2
55D10L255D10R255D10L255D10R255":
FORX=7TO42STEP11:FORY=9TO44STEP1
2:CIRCLE(X,Y),4,4:NEXTY:NEXTX:PA
INT(3,3),3,4:FORA=9TO89STEP20:PA
INT(52,A),4,4:NEXTA:GOTO1
```

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Adventure* and its companion *Rainbow Adventure Tape.*)

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CORRECTIONS

"The ABC Game" (September 1984, Page 157): James F. Taylor advises us that this program will not run as is in 16K. He suggests deleting the following remark lines:

1-10, 145-185, 275-305, 411-415, 461-464, 481-483, 561-565, 591-596, 681-685, 841-845, 911-915, 1001-1009

"The Trip" (August 1984, Page 90): Jacques Bourgeois tells us that a reader questioned his use of a minus sign in place of an equal sign in the statement *IF RND (2)-1 THEN . . .* in Line 222. He assures us that this unusual syntax does work properly in this instance.

"Pretty As A Picture" (May 1984, Page 137): Tom Szlucha states that there are a number of problems with the program, and sends along a corrected listing of the first 47 lines of the program. Here it is:

```
0 CLEAR 500:AR=0:GOTO220:'DUMPFI
X 9/18/84
10 AR=1:CX=0:PI=INT(PX/S+.5):FOR
X=0 TO255 STEPPX:P=S*-X:F=0:B=0:
FORY=191TO0STEP-1
20 IFPPOINT(X,Y)=CL THEN 40 ELSE
 80
30 GOTO 80
40 IF F>0 THEN 60
50 IF B>0 THEN GOSUB 160
60 F=F+S:GOTO 100
70 IF B> 0 THEN 90
80 IF F>0 THEN GOSUB 170
90 B=B+S
100 NEXT Y
110 IF B>0 THEN GOSUB 160
120 IF F> 0 THEN GOSUB 170
130 PRINT#-2,"M"BD","P
140 NEXTX
150 GOTO 180
160 PRINT#-2,"R"+STR$(B)+","+STR
$(CX):B=0:RETURN
170 PRINT#-2,"J"+STR$(F)+","+STR
$(CX):F=0:RETURN
180 CLS:INPUT"ANOTHER COLOR Y/N"
;R$:IF R$="Y" THEN AR=1:GOTO290
190 PRINT#-2,"M0,-100":PRINT#-2,
"A"
200 POKE 150,87:POKE65494,0
210 CLS:PRINT"FINISHED":END
220 CLS:PRINT"CGP-115 SCREEN DUM
P":PRINT:INPUT"DRAW TEST PATTERN
 Y/N";R$
230 IF R$="Y" THEN GOSUB 470
240 PS=PEEK(&HB6)
250 PMODE PS
260 CLS:INPUT"PLOTTING SCALE 1X
OR 2X";S:IF S<1 OR S>2 THEN 260
270 S=INT(S)
280 IF PS=3 THEN PX=2 ELSE PX=1
290 CLS
300 IF PS=3 THEN PRINT"PMODE 3 C
OLORS                  0=BLACK
                       1=GREEN
     5=BUFF            2=YELLOW
     6=CYAN            3=BLUE
     7=MAGENTA         4=RED
     8=ORANGE"
310 IF PS=4 THEN PRINT"PMODE 4 C
OLORS                  0=BLACK
     5=BUFF            1=GREEN"
320 PRINT:PRINT"BE SURE YOU INPU
T COLOR WHICH IS COMPATIBLE WITH
 SCREEN MODE""
330 PRINT:INPUT"COLOR TO SENSE";
CL:IF CL<0 OR CL>8 THEN 330
340 CLS:PRINT"0=BLACK
1=BLUE        2=GREEN
3=RED"
350 PRINT:INPUT"DRAW WITH WHICH
COLOR PEN";CP:IF CP<0 OR CP>3 TH
EN 350
360 IF AR=1 THEN PRINT#-2,"H":GO
TO430
370 BD=(480-192*S)/2:CX=0
380 POKE 65495,1
390 POKE 150,180
400 PRINT#-2,CHR$(18)
410 PRINT#-2,"M0,-300*S"
420 PRINT#-2,"I"
430 PRINT#-2,"C"CP
440 PRINT#-2,"M"BD","STR$(CX)
450 SCREEN1,0:PMODE PS,1
460 GOTO10
```

This should be typed in after deleting everything before Line 470.

"Cooking With CoCo" (November 1984, Page 146): Colin Stearman passes along a note from a reader who says that Radio Shack's disk versions of *EDTASM, Scripsit* and *Spectaculator* (all of which use the Color TRSDOS operating system) use bytes 17 and 18 of the directory entry, which conflicts with the file creation date area used by his program. Dates are not put into the file when these programs create files and they should pose no real problem. Colin also cautions that files created by these programs should not be redated with the BASIC program on Page 148. This problem may also occur with future Radio Shack programs that use Color TRSDOS (which is supplied on each program disk in each package).

"Adding Auto Answer To Modem I" (November 1984, Page 19): Tony Sharp advises us that there may be a problem with installing his modification in the newer Modem IB, due to some changes in the circuit board. One difference that has been noted is that the voltage regulator is now called VR1 instead of U1.

"CC-Talk" (November 1984, Page 50): There was an error in production that misplaced part of two lines. Here they are in the correct form:

```
140 CLS:PRINTTAB(8)"BUFFER CONTE
NTS":PRINTTAB(6)"spaceMORE/enter
EXIT":PRINT
170 BB=TB:BE=&H7CFF' buffer star
t and end addresses
```

BITS AND BYTES OF BASIC

16K

Finalizing The Rainbow Checkbook

By Richard White
Rainbow Contributing Editor

This is the "Beginners Issue" where we welcome all of you that have recently become proud owners of a CoCo and have joined the RAINBOW family of readers. We will mark the occasion with a bit of a celebration, for *Rainbow Checkbook, Version 1.0* is complete, and the listing follows this column.

Over the past few months, I have been writing about the program as it developed. Both program logic and syntax have been discussed in their natural setting, a working program. One consequence has been the need to revise the code previously discussed and explain the reasons for the changes. Changes come about for two reasons. First, for a better idea. As the programmer works with a program, inadequacies become evident and revisions to fix these are installed. Second are the pure bugs.

Even with extensive testing, obscure bugs continue to be found in most programs. That's why I say *Version 1.0* is the first to be published and not the first one written. It is reasonably clean and should do most of the job that needs to be done. It is hardly a final version if such a version exists. Since a program continues to evolve with time, it should be organized to facilitate change. To me, that means defining specific program functions and assigning blocks of line numbers to these functions. I made a table of these functions at the start and have stayed with it throughout.

> ***"Version 1.0 . . . is hardly a final version . . . Since a program continues to evolve with time, it should be organized to facilitate change."***

LINES	FUNCTION
1-9	Most Frequently used subroutines
10-99	Other subroutines
100-199	Enter items
200-299	Edit records and update balances
400-499	Strip cleared items to make updated current file
600-699	Print report
900-999	Tape and disk I/O
2000-2099	Initialization
2100-2199	Make new file
10000	Save program routine
10100	PCLEAR 1 routine

Version 1.0 contains all the functions shown in the table in the line number blocks shown. Note that the most frequently used lines go to the beginning of the program and the least used lines to the end. Each time there is a *GOSUB* or *GOTO,* BASIC starts at the beginning of the program to search for the required line. It makes no sense for it to have to continually search over lines that are used only once during the normal operation of the program. So, all initialization goes to the end rather than the beginning of the program where you will see it many times. On the other hand, frequently called subroutines should be at the beginning where BASIC can quickly find them. And, the smaller the line number, the fewer bytes it takes to store the subroutine call. In any case, I like small line numbers. They are easier to remember. I also see no need to keep increments of 10 between line numbers as you can see from the listing.

Another word of advice to the beginner. If you organize your program from the beginning, you will not need to renumber it. *RENUM* will destroy all the structure you carefully developed

---

(Richard White has a long background with microcomputers and specializes in BASIC *programming. With Don Dollberg, he is the author of the* TIMS *data base management program.)*

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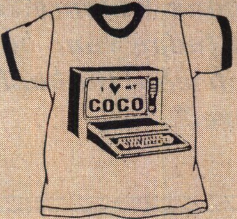

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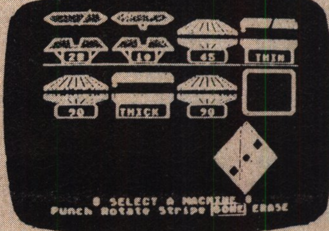

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and make trouble-shooting much more difficult. There is a place for *RENUM* — it is useful to make a user version of a program, numbered at increments of one. This both shortens the program and speeds it a tad. But, keep your structured source version for editing and upgrading. Renumbering the listing to increments of one saves 84 bytes in spite of the fact that I had already reduced memory usage by putting the subroutines at the beginning.

A good program today should be as self-documenting as possible. Still, some words of wisdom are generally needed to get the user off on the right foot. Perhaps the best place to start is to explain why the program was written in the first place. You see, there was this pile of bank statements on my desk — about six months' worth. Reconciling the checkbook to the bank statements is a pain and the program I wrote way back when did not do that. I looked at the old program, but it was written before I discovered structuring a BASIC program. Starting from scratch looked easier. The real celebration came yesterday when I worked down through the (now nine months') pile, finding less than $100 worth of mistakes. It's a relief to know that there will be no OM (out of money) messages from the bank.

The easiest way for you to get up and running with *Rainbow Checkbook* is to buy a Jan. 1985 RAINBOW ON TAPE. As published, the program runs in a 16K tape-based Extended BASIC machine. Those with disk drives should have 32/64K machines or be willing to cut some of the code out. For example, you might make two versions, one without the printer block starting at 600 and one without the editor and New-month routines starting at 200 and 400. This way you can enter and edit data with one version, save the file, and load the other version to print the file.

If you have been typing the program in with me over the last few months, check your code against the listing. There have been a number of changes, both added features and debugs.

When you load and run the program, you are shown the first menu that offers lOAD FILE or nEW FILE options. Choose new file by keying 'N'. You are now prompted for account information including name, bank, account number and date. You are then asked for your last bank statement balance. This is what the bank thinks your balance is and not what is shown in your checkbook. Since there are always some outstanding items in your checkbook that the bank does not know about, the bank's balance must be different from any shown in your checkbook. Now you enter all the outstanding items in your checkbook. Your options are shown in the lines at the bottom of the entry screen. You can scroll back and forth through your file using the up and down arrows and edit entries. However, you cannot add items or make changes from the review mode.

> ***"A correction entry allows you to adjust your balance without changing the calculated bank balance. It's a way to fudge your balance to match what the bank says you have."***

When all items are entered, exit by keying 'S' to get to I/O routines. Here you can save to tape, disk or printer. If you do print your file, you will be returned to the normal input screen where you can key 'S' again to save your file to tape or disk. I use the name CURRENT and let BASIC append the default disk extension DAT. The next time you enter the program choose 'L' to load your file.

The input screen is nearly the same as New-file except a *CLEAR* function has been added. When you get a bank statement, first make sure that all items in your checkbook are in your current file. Next, go through your checkbook, check off all items that have cleared the bank and correct any entry errors. Now, load your current file and step back through it using the up-arrow key. Compare each entry in the file with that in your checkbook. If an item has been cleared, key 'C' and the calculated bank balance will be adjusted, then the status letter will change from 'O' to 'C'. If you clear an item by mistake, key 'C' again to toggle back to 'O' status. If you find mistakes in the file, key 'E' to get to edit mode to make the correction.

Warning! Never edit a cleared item. The program does not adjust the bank balance for changes made in the edit mode. If you need to edit a cleared item, first toggle it back to 'O', edit it and then toggle the status back to 'C' from input.

In edit mode you can change the check number, key 'N' then the new number, change an entry to adjustment or deposit, key 'A' or 'D', or change an adjustment to a correction. For a correction key 'C'. Correction does not show on the command line since it was a very late (read yesterday) addition. A correction entry allows you to adjust your balance without changing the calculated bank balance. It's a way to fudge your balance to match what the bank says you have. Note that you cannot enter a correction directly from the input mode. Rather, enter an adjustment and edit the entry to the correction type.

When you enter a check, enter it as a positive number and the program automatically deducts the amount from your checkbook balance. A deposit is automatically added to the balance. An adjustment may be either positive or negative. An interest credit should be entered as a positive number since it increases your balance. Service charges should be entered as negative numbers.

In input mode, you can duplicate the previous entry, like the date, simply by hitting ENTER for that field. The same happens in edit, so you only key in entries for fields you need to change. When you leave edit, you are returned to input, but at the end of the file. Already I see a number of changes for *Version 2.0*.

When you have corrected your file and cleared all items that have cleared the bank for the month, your bank balance from the program should match that shown on the statement. When it doesn't (to err is human, it's not the computer's fault), look for errors both in your current file in the program and for errors in your checkbook. A printout is very handy here. Key 'S' to get to the Save Menu, then 'P' for the Printer. Change the Baud rate, if necessary, by hitting ENTER and then keying in the rate you want. Next, use the down-arrow to move the cursor next to PRINT and press ENTER. The program will print the account information, allow you to update the date if necessary and then list the current file. When all is right, print a copy of the current file to store with the checks and bank statement for the month.

Finally, you will want to use the New-month routine to strip all cleared items out of the current file to a tape or disk archive file. This routine saves a file of cleared items that you might title JAN85 or JAN85/CLR for disk. It also

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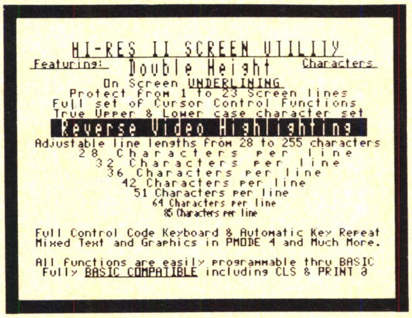

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Mixed Text and Graphics	Yes	Yes	Yes
Separate Text & Graphics	Yes	Yes	No
Print @ fully implemented	Yes	Yes	Yes
Print @ on all line lengths	Yes	Yes	51 only
Different line lengths	28 to 255 (9)	28 to 255 (9)	51 only (1)
Automatic Key Repeat	Yes	Yes	Yes
Adjustable Key Repeat	Yes	No	No
Auto Repeat Disable	Yes	No	No
Erase to end of line/screen	Yes	Yes	Yes
Home Cursor	Yes	Yes	Yes
Solid or Blinking Cursor	Yes	No	Yes
CLS command supported	Buff/Biack	Buff/Black	Buff/Black
X,Y Coordinate Cursor Positioning	Yes	Yes	No
Double Size Characters	Yes	Yes	No
Individual/Continuous Highlighting	Yes	Yes	No
On Screen Underlining	Yes	Yes	No
Clear Key functional	Clear/L keys	Clear key	No
16.32 & 64K Supported	Yes	Yes	Yes
Green or Black Background Color	Yes	No	No
Dual Character sets for Enhanced 64 and 85 Characters per line display	Yes	No	No
Protected Screen Lines (programmable)	1 to 23	No	No
Full Control Code Keyboard for Screen control directly from the keyboard	Yes	No	No
Programmable Tab Character Spacing	Yes	No	No
Full Screen Reverse Function	Yes	Yes	No
Switch to & from the Standard 16 by 32 Screen for full compatability	Yes	No	No
On Error Goto Function	No	No	Yes
Extended Basic Required	No	Yes	Yes
All Machine Language Program	Yes	Yes	Yes
RAM Required in addition to Screen RAM	2K	2K	2K
Program Price (Tape)	$24.95	$19.95	$29.95

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saves the full current file with the extension BAK if you are on disk. If you loaded the file from tape, New-month saves to tape. The same applies with disk. Finally, New-month strips all cleared items from your current file and returns you to input. At this point you should save this new current file.

Newcomers to RAINBOW should know that this month's "Bits and Bytes of BASIC" is different from normal in that I did not discuss any BASIC code. Next month we will resume our line by line discussion of the program. I will take up the printer code first and show some do's and don'ts in making BASIC print a formatted, multi-page report. In the meantime, do some testing of *Rainbow Checkbook*. Suggestions for improvements to go into *Version 2.0* may be sent to me care of THE RAINBOW.

15	92
32	131
68	134
200	180
232	231
410	208
600	65
640	100
950	2
2110	79
END	46

The listing:

```
0 GOTO10100
1 PRINTCHR$(191);:I$=INKEY$:IFI$
=""THENFORX=0TO5:NEXT:PRINTCHR$(
8);:GOTO1ELSEPRINTCHR$(8);:RETUR
N
2 F=INSTR(F1,A$(V),"$"):RETURN
4 PRINT:PRINT"current date: ";DA
$
5 LINEINPUTI$:IFI$<>""THENDA$=I$
:RETURNELSERETURN
10 LC$=CC$:LD$=CD$:LA=CA:LB=CB:L
S$=CS$:LN$=CN$
11 PRINT@96,USINGS4$;LC$;:PRINT"
  "LD$:PRINT@108,USINGSS$;LA:PRI
NT@119,USINGSS$;LB;:PRINTSTRING$
(63,32);:PRINT@128,USINGSN$;LS$;
:PRINTLN$:RETURN
12 F1=1:V=CR-1:GOSUB2:LC$=MID$(A
$(V),F1,F-F1):F1=F+1:GOSUB2:LD$=
MID$(A$(V),F1,F-F1):LS$=MID$(A$(
V),F+1,1):LN$=MID$(A$(V),F+3,LEN
(A$(V))-F+3):LA=A(V,0):LB=A(V,1)
:RETURN
14 CC$=LC$:CD$=LD$:CA=LA:CB=LB:C
S$=LS$:CN$=LN$:IFF1=2THENRETURN
15 PRINT@PS,USINGS4$;CC$;:PRINT"
  "CD$:PRINT@PS+12,USINGSS$;CA:P
RINT@PS+23,USINGSS$;CB;:PRINTSTR
ING$(63,32);:PRINT@PS+32,USINGSN
$;CS$;:PRINTCN$:RETURN
16 F1=1:V=CR:GOSUB2:CC$=MID$(A$(
V),F1,F-F1):F1=F+1:GOSUB2:CD$=MI
D$(A$(V),F1,F-F1):CS$=MID$(A$(V)
,F+1,1):CN$=MID$(A$(V),F+3,LEN(A
$(V))-F+3):CA=A(V,0):CB=A(V,1):R
ETURN
17 IFCR>1THENCR=CR-1:GOSUB14:GOS
UB12:GOSUB11:RETURNELSERETURN
18 IFCR<LR-1THENCR=CR+1:GOSUB10:
GOSUB16:GOSUB15:RETURNELSEGOSUB1
0:PRINT@224,STRING$(95,32):FG=0:
IFCR<LR THENCR=CR+1:RETURNELSERE
TURN
22 IFI$=CHR$(13)THENCC=CC+1:CC$=
STR$(CC):    CC$=RIGHT$(CC$,LEN(C
C$)-1):PRINT@224,USINGS4$;CC$:RE
TURN
24 IFVI>0THENPRINTUSING"#";VI;:L
INEINPUTI$:CC$=STR$(VI)+I$:CC$=R
IGHT$(CC$,LEN(CC$)-1):CC=VAL(CC$
):RETURN
26 CC$="DEP":PRINT@224,CC$;:RETU
RN
28 CC$="ADJ":PRINT@224,CC$;:RETU
RN
29 CC$="CORR":PRINT@224,CC$;:RET
URN
```

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```
30 PRINT@229,"";:LINEINPUTI$:IFI
$<>""THENCD$=I$
31 PRINT@229,USING"%   %";CD$
32 PRINT@236,"";:IFFG<>1THENLINE
INPUTI$:I=VAL(I$):IFI<>0THENCA=I
 ELSEELSECA=0
34 PRINT@236,USINGSS$;CA;:RETURN
36 IFVAL(CC$)=0THENCB=CB+CA ELSE
CB=CB-CA
37 PRINT@247,USINGSS$;CB;:PRINTU
SINGSN$;CS$;:LINEINPUTI$:IFI$<>"
"THENCN$=I$ELSECN$=" "
38 A$(CR)=CC$+"$"+CD$+"$"+LEFT$(
CS$,1)+"$"+CN$:A(CR,0)=CA:A(CR,1
)=CB:RETURN
40 CR=CR+1:LR=CR:GOSUB10:PRINT@2
24,STRING$(95,32):FG=0:RETURN
50 PRINT@8,RC$,"ITEM  DATE      A
MOUNT   BALANCE":RETURN
52 PRINT@352,"LAST BANK BALANCE
";:PRINTUSINGSS$;BB:RETURN
54 PRINT@384,"<ENTER> =NEXT CHEC
K #","1ST DIGIT STARTS NEW # SER
IES":RETURN
56 PRINT@448,"dEPOSIT aDJUSTMENT
 vOID cLEARED eDIT sAVE 1OAD nEW
 MONTH "CHR$(94)"'S";:RETURN
58 PRINT@448,"dEPOSIT aDJUSTMENT
 vOID","eDIT sAVE"CHR$(94)"'S";:
RETURN
60 GOSUB22:GOSUB30:GOSUB36:GOSUB
40:RETURN
62 GOSUB26:GOSUB30:GOSUB36:GOSUB
40:RETURN
64 GOSUB28:GOSUB30:GOSUB36:GOSUB
40:RETURN
66 I$=CHR$(13):GOSUB22:FG=1:GOSU
B30:GOSUB36:FG=0:GOSUB40:RETURN

68 PRINT@320,"REVIEW ENTRIES
     ";:PO=335:FG=1:GOSUB17:RETU
RN
100 CLS:PS=224:GOSUB50:GOSUB52:G
OSUB54:GOSUB56:PRINT@128,STRING$
(192,32):CR=LR:GOSUB12:GOSUB11:F
1=2:GOSUB14:F1=0:CC=VAL(CC$)
110 PRINT@320,"ENTER OUTSTANDING
 ITEMS          ";:PO=224
120 PRINT@PO,"";:GOSUB1:VI=VAL(I
$):IFFG=0AND(VI>0OR I$=CHR$(13))
GOSUB60:GOTO120
130 J=INSTR(1,"DAVCESLN"+CHR$(94
)+CHR$(10),I$):IFFG=0THENONJ GOS
UB62,64,66,160,200,900,950,400,6
8,18ELSEONJ GOSUB2160,2160,2160,
160,200,900,950,400,17,18
140 IFJ>4 ANDJ<9THEN100
150 IFCR=LR THEN110ELSE120
160 IFCS$="O"THENCS$="C":GOSUB15
:GOSUB38:IFLEFT$(CC$,4)<>"CORR"T
HENIFVAL(CC$)=0THENBB=BB+CA ELSE
BB=BB-CA ELSEELSE170
165 PRINT@371,"";:PRINTUSINGSS$;
BB;:PRINT@343,"";:RETURN
170 CS$="O":GOSUB15:GOSUB38:IFLE
FT$(CC$,4)<>"CORR"THENIFVAL(CC$)
=0THENBB=BB-CA ELSEBB=BB+CA
175 PRINT@371,"";:PRINTUSINGSS$;
BB;:PRINT@343,"";:RETURN
200 CLS:GOSUB50:PRINT@72,"UNEDIT
ED ENTRY":PRINT@201,"EDITED ENTR
Y":PRINT@321,"TYPE FIELD ENTRY C
ORRECTION"," <enter> FOR NEXT FI
ELD":IFFG=1THENTF=1:FG=0
210 I$=INKEY$:PS=96:GOSUB16:GOSU
B15:PRINT@224,STRING$(95,32);:PR
INT@416,"nEW #, dEP, aDJ, -=DELE
TE, +=ADDUP/DOWN ARROWS, rETURN
  ";:PS=224:CT$=CC$:TA=CA
215 GOSUB1:IFI$=CHR$(13)THENPRIN
T@224,CC$;:GOTO240ELSEJ=INSTR(1,
"NDA-+R"+CHR$(94)+CHR$(10),I$):O
NJ GOSUB220,26,28,225,230,217,23
5,237
216 IFFG=1THENFG=0:GOTO210ELSEIF
I$<>"R"THEN:GOTO240ELSEFG=TF
```

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```
217 RETURN
220 PRINT@224,"";:GOSUB1:VI=VAL(
I$):IFI$="A"THENGOSUB28ELSEIFI$=
"C"THENGOSUB29ELSEGOSUB22
221 RETURN
225 FORX=CR TOLR-2:A$(X)=A$(X+1)
:A(X,0)=A(X+1,0):IFVAL(CC$)>0THE
NA(X,1)=A(X+1,1)+CA:CB=CB+CA ELS
EA(X,1)=A(X+1,1)-CA:CB=CB-CA
227 NEXT:PRINT@96,STRING$(95,32)
;:CC$="":CD$=""::CA=0:CS$="":CN$
="ITEM DELETED":CR=CR-1:LR=LR-1:
FG=1:RETURN
230 CC$=" ":CD$=" ":CS$=" ":CA=0
:TA=0:CN$="MAKE NEW ENTRY":FG=1:
FORX=LR TOCR+1STEP-1:A$(X)=A$(X-
1):A(X,0)=A(X-1,0):A(X,1)=A(X-1,
1):NEXT:CB=A(X-1,1):LR=LR+1:GOSU
B38
232 PS=96:GOSUB16:GOSUB15:PRINT@
416,"nEW #, dEP, aDJ, -=DELETE":
PRINTSTRING$(28,32);:PS=224:GOSU
B1:FG=0:J=INSTR(1,"NDA-",I$):ONJ
 GOSUB220,26,28,225
234 IFJ>0THEN240ELSE232
235 FG=1:IFCR>1THENCR=CR-1:GOSUB
16:PS=96:GOSUB15:PS=224:RETURNEL
SERETURN
237 FG=1:IFCR<LR-1THENCR=CR+1:GO
SUB16:PS=96:GOSUB15:PS=224:RETUR
NELSERETURN
240 PRINT@416,STRING$(45,32):GOS
UB30:IFVAL(CT$)=0THENIFVAL(CC$)=
0THENTA=CA-TA:GOTO242ELSETA=-TA-
CA:GOTO242
241 IFVAL(CC$)=0THENTA=TA+CA ELS
ETA=TA-CA
242 PRINT"TA"TA,"CA"CA;:FORX=1TO
2000:NEXT: FORX=CR TOLR-1:A(X,1)
=A(X,1)+TA:NEXT:CB=A(CR,1):PRINT
@247,USINGSS$;CB;:LINEINPUTI$:IF
I$<>""THENCS$=I$
244 PRINT@256,USINGSN$;CS$;:LINE
INPUTI$:IFI$<>""THENCN$=I$
246 PRINT@259,CN$:GOSUB38:GOTO21
0
400 CLS:PRINT@8,RC$,"   STRIP &
SAVE CLEARED ITEMS",,,,,TAB(8)"t
APE",,,,TAB(8)"dISK",,:GOSUB1:IF
I$="D"THEND=1ELSEIFI$="T"THEND=-
1ELSE400
410 PRINT:PRINT:IFD=-1THENPRINT"
  TAPE FILE"ELSEPRINT"  DISK FIL
E"
415 PRINT:PRINT"FILENAME";:IFD=1
THENPRINT" AND EXTENSION"
420 LINEINPUTCF$:GOSUB4:CT=0:FOR
CR=1TOLR-1:GOSUB16:IFCS$="C"THEN
CT=CT+1:NEXTELSENEXT
425 OPEN"O",D,CF$:PRINT#D,CT+1:P
RINT#D,BB:PRINT#D,CB:PRINT#D,AN$
:PRINT#D,BA$:PRINT#D,AC$:PRINT#D
,DA$:FORCR=1TOLR-1
430 GOSUB16:IFCS$="C"THENPRINT#D
,A$(CR):PRINT#D,A(CR,0):PRINT#D,
A(CR,1):NEXTELSENEXT
435 CLOSE:CT=0:OPEN"O",D,NM$+"/B
AK":PRINT#D,LR:PRINT#D,BB:PRINT#
D,CB:PRINT#D,AN$:PRINT#D,BA$:PRI
NT#D,AC$:PRINT#D,DA$:FORX=1TOLR-
1:PRINT#D,A$(X):PRINT#D,A(X,0):P
RINT#D,A(X,1):NEXT:CLOSE
440 CLOSE:CT=0:FORCR=1TOLR-1:GOS
UB16:IFCS$="O"THENCT=CT+1:A$(CT)
=A$(CR):A(CT,0)=A(CR,0):A(CT,1)=
A(CR,1):NEXTELSENEXT
445 FORX=CT+1TOLR-1:A$(X)="":NEX
T:LR=CT+1:CR=CT:RETURN
600 'TARGET LINE
605 BP=PEEK(150):BU=INSTR(1,"16*
18**41******87**************180"
,RIGHT$(STR$(BP),LEN(STR$(BP))-1
)):BU=9600/BU
605 POKE65494,0:BP=PEEK(150):BU=
INSTR(1,"16*18**41******87******
********180",RIGHT$(STR$(BP),LEN
(STR$(BP))-1)):BU=9600/BU
610 CLS:PRINT@137,"PRINT ROUTINE
S",,,"    CURRENT BAUD RATE ="BU
,TAB(6)"RESET BAUD RATE",,,"
PRINT",,,,"    RETURN":CT=1
615 CT$=RIGHT$(STR$(CT),1):LP=IN
STR(1,"       1 2 3",CT$):LP=LP*3
2+2:PRINT@LP,">";:GOSUB1:PRINT@L
P," ";:IFI$=CHR$(10)ANDCT<3THENC
T=CTT+1:GOTO615ELSEIFI$=CHR$(94)
ANDCT>1THENCT=CT-1:GOTO615ELSEIF
I$<>CHR$(13)THEN615ELSEONCT GOTO
620,630,100
620 PRINT" ";:INPUT"ENTER NEW BA
UD RATE";BU$:BU$=LEFT$(BU$,1):BL
=INSTR(1,"361249",BU$):IFBL=0THE
NPRINT"baud rate error":SOUND100
,50:GOTO605
625 BU(1)=180:BU(2)=87:BU(3)=41:
BU(4)=18:BU(5)=6:BU(6)=1:BU=BU(B
L):POKE150,BU:GOTO605
630 CLS:PRINT@96,"SET PRINTER AN
D PAPER AND PRESS any key.":GOSU
B1:FORX=1TO3:PRINT#-2," ":NEXT:P
RINT#-2,TAB(8)"ACCOUNT NAME:    "
AN$:PRINT#-2,TAB(8)"BANK NAME:
    "BA$:PRINT#-2,TAB(8)"ACCOUNT
 NUMBER: "AC$
640 GOSUB4:PRINT#-2,TAB(8) "DATE
 PRINTED:     "DA$:PRINT#-2," ":P
RINT#-2,TAB(8)"CALCULATED BALANC
E AT BANK ="BB:PRINT#-2," ":PRIN
```

```
T#-2,TAB(8)"CHECK# DATE      AMOU
NT   BALANCE  STATUS NOTE":PRINT
#-2," ":PG=13
650 FORCR=1TOLR-1:GOSUB16:PRINT#
-2,TAB(9)"";:PRINT#-2,USING"%  %
";CC$;:PRINT#-2,USING"  %   %";C
D$;:PRINT#-2,TAB(22)"";:PRINT#-2
,USINGSS$;CA;:PRINT#-2,TAB(32)""
;:PRINT#-2,USINGSS$;CB;:PRINT#-2
,"    "CS$"    "CN$
655 PG=PG+1:IFPG>61THENFORX=1TO7
:PRINT#-2," ":NEXT:PRINT#-2,TAB(
8)"CHECK# DATE  AMOUNT   BALANCE
  STATUS NOTE":PRINT#-2," ":PG=5
660 NEXT:FORX=PG TO67:PRINT#-2,"
 ":NEXT:RETURN
900 CLS:PRINT@8,RC$,"       SAVE
OR PRINT DATA",,,,,TAB(8)"tAPE",
,,,TAB(8)"dISK",,,,TAB(8)"pRINTE
R":GOSUB1:IFI$="D"THEND=1ELSEIFI
$="T"THEND=-1ELSEIFI$="P"THEN600
ELSE900
905 GOSUB4
910 GOSUB985:OPEN"O",D,NM$:PRINT
#D,LR:PRINT#D,BB:PRINT#D,CB:PRIN
T#D,AN$:PRINT#D,BA$:PRINT#D,AC$:
PRINT#D,DA$:FORX=1TOLR-1:PRINT#D
,A$(X):PRINT#D,A(X,0):PRINT#D,A(
X,1):NEXT:CLOSE:RETURN
950 CLS:PRINT@8,RC$,TAB(11)"LOAD
 DATA",,,,,TAB(8)"tAPE",,,,TAB(8
)"dISK":GOSUB1:IFI$="D"THEND=1EL
SEIFI$="T"THEND=-1ELSE950
960 GOSUB985:OPEN"I",D,NM$:INPUT
#D,LR,BB,CB:LINEINPUT#D,AN$:LINE
INPUT#D,BA$:LINEINPUT#D,AC$:LINE
INPUT#D,DA$:GOSUB970:FORX=1TOLR-
1:INPUT#D,A$(X):INPUT#D,A(X,0):I
NPUT#D,A(X,1):NEXT:CLOSE
962 CR=1:GOSUB16:IFVAL(CC$)=0THE
NA(0,1)=A(1,1)-A(1,0)ELSEA(0,1)=
A(1,1)+A(1,0)
965 PRINT:PRINT"PRESS ANY KEY TO
 CONTINUE ":GOSUB1:RETURN
970 CLS:PRINT@98,"FILENAME= "NM$
:PRINT:PRINT"  ACCOUNT INFORMATI
ON":PRINT:PRINT"NAME: "AN$:PRINT
"BANK: "BA$:PRINT"ACCT #: "AC$:P
RINT"FILE UPDATED: "DA$:RETURN
985 PRINT:IFD=-1THENPRINT"TAPE F
ILE"ELSEPRINT"DISK FILE"
990 PRINT:PRINT"FILENAME";:IFD=1
THENPRINT" AND EXTENSION: ",NM$E
LSEPRINT": "NM$
995 LINEINPUTI$:IFI$<>""THENNM$=
I$:RETURNELSERETURN
2000 CLEAR3500:DIMA$(100),A(100,
1)
2050 RC$="RAINBOW CHECKBOOK":SS$
="##,###.##":SN$="% %":CR=1:LR=1
:S4$="%  %":CS$="O":A$(0)=" $ $
$FIRST ENTRY BELOW"
2100 CLS:PRINT@2,"rainbow checkb
ook version 1.0":PRINT@47,"BY":P
RINT@73,"RICHARD WHITE":PRINTTAB
(7)"COPYRIGHT (C) 1984":PRINT:PR
INT:PRINTTAB(8)"lOAD FILE":PRINT
:PRINTTAB(8)"nEW FILE"
2110 GOSUB1:IFI$="L"GOSUB950:GOT
O100ELSEIFI$<>"N"THEN2110
2115 CLS:PRINT@96," enter accoun
t name":LINEINPUTAN$:PRINT:PRINT
" enter bank name":LINEINPUTBA$:
PRINT:PRINT" enter account #":LI
NEINPUTAC$
2120 CLS:GOSUB50:PRINT:PRINT:PRI
NT"ENTER LAST BANK STATEMENT
   BALANCE  ";:LINEINPUTI$:BB=VA
L(I$):PRINT@128,STRING$(64,32):P
RINT@128,"note:  REPORTED CHECKB
OOK      BALANCE WILL NOT MATCH
 YOUR     BALANCE UNTIL OUTSTAND
ING"
2125 PRINT"CHECKS, CHARGES, DEPO
SITS  AND   CREDITS AT STATEMENT
 TIME ARE   ENTERED.";:GOSUB1:CB
=BB:GOSUB52:GOSUB54:GOSUB56:PRIN
T@128,STRING$(192,32)
2130 PRINT@320,"ENTER OUTSTANDIN
G ITEMS         ";: PO=224:PS=PO
2140 PRINT@PO,"";:GOSUB1:VI=VAL(
I$):IFFG=0AND(VI>0OR I$=CHR$(13)
)GOSUB60:GOTO2140
2150 J=INSTR(1,"DAVES"+CHR$(94)+
CHR$(10),I$):IFFG=0THENONJ GOSUB
62,64,66,200,900,68,18ELSEONJ GO
SUB2160,2160,2160,200,900,17,18
2155 IFJ=5 THENGOTO100
2157 IFCR=LR THEN2130ELSE2140
2160 RETURN
10000 SAVE"RNBWCKBK
10100 PCLEAR1:GOTO2000
20000 FORX=0TO64:PRINT@X,CHR$(32
+X):PRINT@X+96,CHR$(PEEK(1024+X)
);:NEXT
```

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The 6809 Instruction Set — Zeroing In On 'The Real Thing'

By R. Bartly Betts
Rainbow Contributing Editor
With Programs By Chris Bone

I am sure you are finger-weary if you typed in all of last month's listing by hand. You deserve a treat and I hope we will have one for you this month.

I think we are almost through the painful part and about ready to have fun. There is still a lot of work to be done, but the work is a lot sweeter when something worthwhile is being accomplished. With the information you now have learned about registers, we can begin on the real thing, the 6809 instruction set.

You have already been using several of the instructions recognized by your assembler. This month you will begin taking a closer look at these instructions, what they do and how to use them.

A great start toward understanding your assembler's instructions is knowing how to interpret the instruction set reference in your assembler manual and the references in other 6809 assembly language programming books. The *EDTASM+* manual seems like a good place to begin. I have the one that came with my cartridge pack, Radio Shack Cat. No. 26-3250. The instruction set references start on Page 39. Page 37 has a section on definition of terms and Page 38 explains the abbreviations used in the set. It will be helpful to refer to these pages when you run up against definition problems. You are probably most familiar with the LD (load) instruction (pages 44 and 45 in my manual). Regardless of what assembler you use, the reference should look something like the following:

LD
Load Register from Memory
(8-Bit)
Source Forms: LDA P; LDB P
Operation: R'<--M
Condition Codes:
H -Not affected
N -Set if the loaded data is negative; cleared otherwise
Z -Set if the loaded data is zero; cleared otherwise
V -Always cleared
C -Not affected
Description: Loads the contents of memory location M into the designated register.

Addressing Modes: Immediate; Extended; Direct; Indexed.

If you take a close look at this instruction, it will provide a basis from which to understand the rest of the instruction set.

First, notice that the reference I typed in is one of two for the LD instruction. This one is labeled as "8-BIT." This instruction is only 8-bit because it only uses registers A and B, both 8-bit registers. You will recall from your study of binary numbers that the maximum value an 8-bit number can contain is 255. If you want to handle numbers larger than 255, you will have to use the 16-bit form of the LD instruction. Actually, the only difference between the two forms of the load instruction is that the 8-bit instruction uses registers A and B while the 16-bit form uses registers X, Y, S and U.

The information about what registers are used in what way is found in the line "Source Forms." The italic 'P' in the line represents a memory location, such as:

LDA 32

where A is the register to be loaded and 'P' is memory location 32.

The line beginning with "Operation:" tells you that a register after the LD operation (R'), has been loaded with a value from memory (M). The arrow in the line indicates the direction of the data flow.

The lines following "Condition Codes:" indicate the effect that the operation has on the five condition code flags. At this point you need not worry about them, their function will become clear in later columns.

(Bartly Betts is a former reporter, magazine editor and store owner now residing in Fort Worth, Texas. He has owned and operated a Color Computer for over three years and is presently taking an electronics and computer course by correspondence. Chris Bone is a college computer science major and has been programming for more than three years. He averages between six and nine hours a day on the CoCo.)

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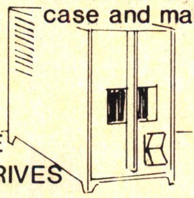

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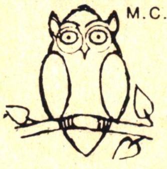

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The "Description:" line restates the function of the operation. In this case it tells you that a register (either A or B) is loaded with the contents of a memory location (indicated by P).

The last line, "Addressing Modes:" deserves a large portion of this month's column. Keeping the addressing modes straight is not difficult once you have had a chance to investigate how they work, so let's investigate the possible modes.

Immediate Addressing

In immediate addressing, the data for an instruction is the actual value of the instruction's operand. An example is:

```
LDA #32
```

The # symbol tells the assembler that the value of 32 decimal is to be loaded into register A. A hexadecimal value could be indicated by:

```
LDA #$20
```

The $ symbol tells the assembler that the value to be loaded is hexadecimal. As before, the # symbol causes a load of the actual value of Hex 20 or decimal 32.

Extended Addressing

It is just as easy to load the contents of a memory location into a register as it is to load an established value. Extended addressing can be used to cause the value of a memory location to be transferred to a register. This is done by leaving off the # symbol from the instruction, such as:

```
LDB 32
```

In this case, register B is loaded with the value that is contained in memory location 32. Again, you can follow the same procedure for Hex:

```
LDB $20
```

If you glance through some of the other instructions in your assembler manual you will see that a great many instructions can operate in both the immediate and extended addressing modes.

Indexed Addressing

Registers X and Y are known as index registers, as noted last month. Although they are not used exclusively for indexed addressing, it is their main function. As 16-bit registers, they can manipulate values up to $FFFF or 65536, which includes all of your computer's memory. In indexed addressing, you load registers X or Y with values that serve as pointers to a memory location. For example:

```
00100 START  LDX   #$500   *Load X with a
                           memory value
00110        LDA   #$20    *Load Hex 20
                           into A
00120        STA   ,X      *Store the value
                           of A into the
                           memory loca-
                           tion pointed to
                           by register X
```

In this example, register X is used as a pointer to memory location $500. You use a comma before the X to show that it is being used as an index to point to a location in memory. The power of indexed addressing lies in the ease with which the "pointer" in the X and Y registers can be adjusted, for example:

```
00100 START  LDX   #$500   *Load X with A
                           memory value
00110        LDA   #$20    *Load A with
                           Hex 20
00120        LDB   #$21    *Load B with
                           Hex 21
00130        STA   ,X+     *Store A in me-
                           mory location
                           $500
00140        STB   ,X      *Store B in me-
                           mory location
                           $501
```

A plus symbol after the register X indicates that it is to be incremented after A is loaded into the memory address to which it is pointing. Thus the STB (store B) command stores the contents of register B into the next memory location, 500+1. An operation such as this could be put into a loop and any number of values could be loaded into sequential memory locations.

If you have not yet done so, it might be better to look at the ST instruction in your assembler manual. You will notice that its purpose is to transfer the value in a register to a memory location, as we have indicated above. The ST instruction can be either an 8- or 16-bit operation and it can operate in extended, direct or indexed addressing.

Inherent Addressing

With this addressing mode we will take a break from mental activity. It is the easiest of all addressing modes to understand because it does not require anything more than knowing what the instructions are and when to use it. Inherent addressing is exactly what its name implies, it provides all of its own information, nothing more needs to be added. For example:

```
RTS
```

is an instruction that causes program control to be returned to the parent routine from a subroutine. No address or values are needed nor, indeed, can

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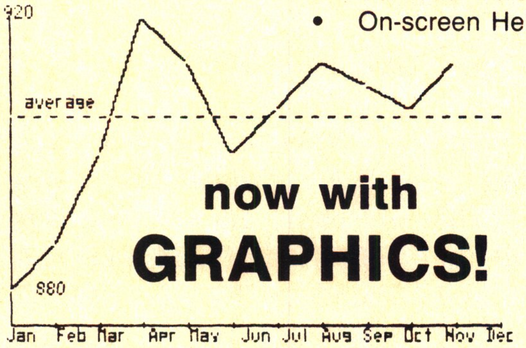

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be included. The return address for the instruction is automatically pulled from the S or hardware stack. There are a number of instructions that use inherent addressing. You might wish to glance through the instruction references and pick out some of the others, like CLR and SWI.

Direct Page Addressing

Direct page or direct addressing involves using the contents of the direct page register as the most significant byte of an address. In effect, your assembler does this anyway, but, on start up, the direct page register contains 0 and thus has no effect on other addresses. Once you put a value into the DP register, however, it is used as an offset for all 8-bit addressing.

In order to load the DP register, you must use the TFR (transfer) instruction, it cannot be loaded directly. For example:

```
LDB #$44 *Load the B register with the value of $44
TFR B,DP *Transfer the contents of B (44) to DP
```

will load a value of 44 into the direct page register. Now, if you issue an instruction:

```
LDB $20
```

the assembler will use the value of $44 as the most significant byte of the address whose contents were loaded into B. The effective address will be $4420. As already mentioned, 8-bits can only hold a maximum value of 255. Thus a direct page address can be any of 256 bytes (0 through 255), beginning at the direct page register address.

Now, after saying all that, I will tell you that we probably won't be doing anything with direct page addressing in the near future, so if it seems confusing, don't worry. You could live quite a happy life without ever using this type of addressing.

Now For The Good Stuff

That's all there is to the various types of addressing. With that under your belt it is time to quit the chatter for this column and get on with the real thing. Listing 1 at the end of the column was written by Chris to make use of some of the information we have passed on this month. Try and figure out what it does before reading the comments. If you can guess what is going on, you have been making great progress. Even if you only recognize some of what the program is for, you should be pleased with yourself. Take the time to study the program thoroughly, it isn't too long, but it contains several good routines that will be.

If all is not clear after studying the program, perhaps the followng will help: the crux of the program is that a green snake is created on a black screen with a green border. You can control the snake with a joystick plugged into the right joystick port. If the snake hits the screen border it is stopped and must change directions to continue. Chris has put lots of comments into the program to help you follow it through. Again, look it over carefully. Try and pick out routines you can load and assemble and try out on your own to see how they work and to see if you can change them to do something a little

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The Test

Now for the hard part. To see if you are really getting the hang of assembly language code, see if you can create a second snake to slither around with the first one, controlled with the left joystick. Use Chris' code to guide you in your efforts. Chris and I would be pleased to see the result of your efforts.

The Second Installment

If that isn't enough to keep you occupied during the next month, here is the second part of the 51-column text generator. This month we are including the portion of the code that will translate keystrokes into machine language generated characters. You will be able to use the new text screen after typing and and assembling the following source code. Before typing in this month's code, however, you will need to load last month's listing and renumber it according to Chris' instructions given with the listing. You will also need to type in and *RUN* the accompanying BASIC driver. The steps you should follow are:

1) Type in this month's source code.
2) When finished, append last month's source code to the new code.
3) Delete the *ORG* line from the beginning of last month's code.
4) Renumber the combined codes. Check your assembler manual for how to do this.
5) Save the combined source codes.
6) Assemble the combined codes.
7) If there are any mistakes, correct them and assemble the code again.
8) Save the resulting machine language code.
9) Type in and save the BASIC listing (Listing 3).
10) When you are sure there are no mistakes in either the machine language code or the BASIC listing, load the machine language listing into memory. Then load the BASIC listing into memory.
11) Run the BASIC listing. You should be presented with a new, 51-column screen and the prompt, "Type what you want:"
12) Begin typing, as fast as you like.
13) Enjoy the new screen. It will soon be yours to use any time you like. It will also soon have several other programming features.

You may find it useful to compare this month's source code with last month's BASIC listing. As the two serve the same purpose, comparing them will help you understand what the source code listing is accomplishing and how it does the job.

The characters you see on your screen are now the text to be used in the finished program and will be 51 columns across the screen. Still to be installed are the hooks to disable the usual text mode and put you entirely into the new mode. As well, some of the other programming features that will accompany the new screen mode are not yet included.

Listing 2 is the source code for the new portion of the 51-column screen program. Listing 3 is the BASIC driver you will need to use the new 51-character screen. Next month we will do away with all BASIC help and you will be in full 51 columns.

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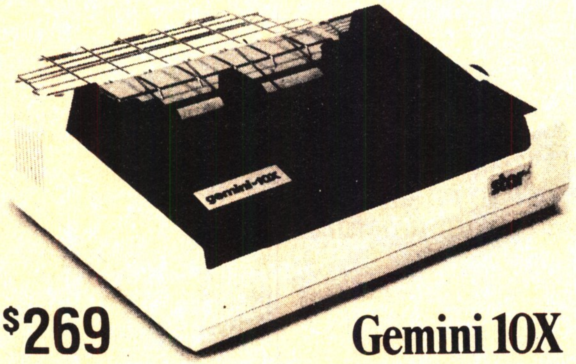

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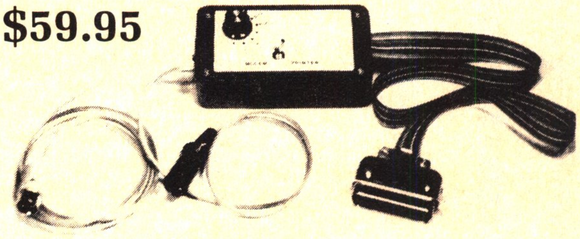

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Listing 1:

```
                   00010 *************************
                   00020 *NO ORG LINE IS GIVEN   *
                   00030 *ASSEMBLE THIS PROGRAM  *
                   00040 *INTO MEMORY WHEREVER   *
                   00050 *EDTASM+ PUTS IT AND RUN*
                   00060 *IT FROM EDTASM+ WITH   *
                   00070 *GSTART IN Z-BUG        *
                   00080 *DELETE REMARKS TO SAVE *
                   00090 *RAM ON 16K SYSTEMS.  IF*
                   00100 *YOU ARE USING THE DISK *
                   00110 *EDTASM+ THEN USE THE   *
                   00120 *MEMORY EFFICIENT WAY AS*
                   00130 *OUTLINED IN THE MANUAL *
                   00140 *THESE GUIDELINES APPLY *
                   00150 *FOR ALL PROGRAMS IN THE*
                   00160 *BYTEMASTER BOTH PAST   *
                   00170 *AND FUTURE AND I AM    *
                   00180 *SORRY FOR ANY PROBLEMS *
                   00190 *THAT HAVE OCCURED.     *
                   00200 *               CHRIS   *
                   00210 *************************
0000 C6   80       00220 START  LDB    #$80    *CHR$(128)=BLACK BLOCK
0002 BD   A92A     00230        JSR    $A92A   *CALL BASIC'S CLS ROUTINE
                   00240 *************************
                   00250 *DRAW BORDER            *
                   00260 *************************
0005 4F            00270        CLRA           *SRART X COORD @ 0
0006 5F            00280 LOOP   CLRB           *SET Y COORD @ 0
0007 17   0082     00290        LBSR   SET     *SET (A,B)
000A C6   1F       00300        LDB    #$1F    *SET Y COORD @ 31
000C 8D   7E       00310        BSR    SET     *SET (A,B)
000E 4C            00320        INCA           *X COORD = X COORD + 1
000F 81   40       00330        CMPA   #$40    *ALL THE WAY TO THE RIGHT?
0011 26   F3       00340        BNE    LOOP    *IF NOT SET THE NEXT PAIR OF POINTS
0013 4F            00350 LOOP1  CLRA           *SET X COORD @ 0
0014 8D   76       00360        BSR    SET     *SET (A,B)
0016 86   3F       00370        LDA    #$3F    *SET X COORD @ 63
0018 8D   72       00380        BSR    SET     *SET (A,B)
001A 5A            00390        DECB           *Y COORD = Y COORD - 1
001B 2A   F6       00400        BPL    LOOP1   *IF Y COORD >0 THEN SET MORE POINTS
001D 8E   00B1     00410        LDX    #SNAKE  *POINT TO BEGINNING OF TABLE OF VALUES
0020 108E 000A     00420        LDY    #10     *10 POINTS IN THE SNAKE
0024 CC   2010     00430        LDD    #$2010  *A=32 B=16 (CENTER OF SCREEN)
0027 ED   81       00440 SCLR   STD    ,X++    *SAVE INTO TABLE
0029 31   3F       00450        LEAY   -1,Y    *Y=Y-1
002B 26   FA       00460        BNE    SCLR    *IF WE HAVEN'T INITIALIZED THE WHOLE TABLE LOOP
002D FC   00B1     00470 WAIT   LDD    SNAKE   *GET FIRST POINT IS SNAKE (BACK END)
0030 8D   6E       00480        BSR    RESET   *SET IT TO BLACK
0032 8E   00B3     00490        LDX    #SNAKE+2 *GET START OF POINT LIST TO SET
0035 EC   84       00500 WLP    LDD    ,X      *GET FIRST POINT
0037 ED   1E       00510        STD    -2,X    *SAVE IT AS NEXT TO LAST ELEMENT
0039 34   10       00520        PSHS   X       *SAVE CURRENT POSITION IN SNAKE
003B 8D   4F       00530        BSR    SET     *SET THE POINT
003D 35   10       00540        PULS   X       *GET BACK CURRENT SNAKE POS
003F 30   02       00550        LEAX   2,X     *POINT TO NEXT ELEMENT
0041 8C   00C5     00560        CMPX   #SNAKE+20 *ALL DONE?
0044 26   EF       00570        BNE    WLP     *IF NOT LOOP
0046 EC   1C       00580        LDD    -4,X    *GET LAST ELEMENT SET
0048 ED   1E       00590        STD    -2,X    *SAVE AS NEW LAST ELEMENT
004A 34   10       00600        PSHS   X       *SAVE PLACE IN TABLE
004C AD   9F A00A  00610        JSR    [$A00A] *CALL ROM JOYSTICK ROUTINE
0050 EC   84       00620        LDD    ,X      *GET JOYSTK(0) INTO A,JOYSTK(1) INTO B
0052 35   10       00630        PULS   X       *RETREIVE TABLE POINTER
0054 81   20       00640        CMPA   #32     *STICK LEFT OR RIGHT?
0056 22   08       00650        BHI    NOLEF   *IF RIGHT THEN GOTO NOLEF
0058 6A   1E       00660        DEC    -2,X    *X COORD = X COORD - 1
005A 26   0E       00670        BNE    UPDN    *IF IT ISN'T ZERO THEN WE ARE STILL ON SCREEN
005C 6C   1E       00680        INC    -2,X    *OTHERWISE MOVE IT BACK
005E 20   0A       00690        BRA    UPDN    *GO CHECK UP/DOWN
0060 6C   1E       00700 NOLEF  INC    -2,X    *X COORD=X COORD + 1
0062 A6   1E       00710        LDA    -2,X    *GET X COORD
0064 81   3E       00720        CMPA   #$3E    *ALL THE WAY RIGHT?
0066 23   02       00730        BLS    UPDN    *IF NOT GO CHECK UP/DOWN
0068 6A   1E       00740        DEC    -2,X    *OTHERWISE MOVE IT BACK
006A C1   20       00750 UPDN   CMPB   #32     *STICK UP OR DOWN?
006C 22   08       00760        BHI    NOUP    *B>32 MEANS DOWN
006E 6A   1F       00770        DEC    -1,X    *Y COORD=Y COORD - 1
0070 26   0E       00780        BNE    PAUSE   *IF STILL ON SCREEN THEN GO PAUSE
0072 6C   1F       00790        INC    -1,X    *MOVE BACK ON SCREEN
0074 20   0A       00800        BRA    PAUSE   *GO PAUSE
0076 6C   1F       00810 NOUP   INC    -1,X    *Y COORD= Y COORD + 1
0078 E6   1F       00820        LDB    -1,X    *GET Y COORD
007A C1   1E       00830        CMPB   #$1E    *STILL ON SCREEN?
007C 23   02       00840        BLS    PAUSE   *IF SO GO PAUSE
007E 6A   1F       00850        DEC    -1,X    *OTHERWISE MOVE IT BACK
0080 8E   5000     00860 PAUSE  LDX    #$5000  *SET DELAY LEN (1=SHORT FFFF=LONG)
0083 BD   A7D3     00870        JSR    $A7D3   *CALL ROM DELAY ROUTINE
0086 BD   A1C1     00880        JSR    $A1C1   *CHECK KEYBOARD
0089 27   A2       00890        BEQ    WAIT    *IF NO KEY KEEP GOING
008B 39            00900        RTS            *BACK TO BASIC
                   00910 *************************
                   00920 *SET POINT @ A,B        *
                   00930 *USE ROM ROUTINE TO     *
                   00940 *CALCULATE MOST OF THE  *
                   00950 *STUFF                  *
                   00960 *************************
008C 34   06       00970 SET    PSHS   A,B     *SAVE A,B FOR RETURN TO CALLER
008E 8E   0098     00980        LDX    #SETRET *GET READY TO TRICK ROM
0091 34   10       00990        PSHS   X       *SAVE SETRET AS RETURN ADDRESS
0093 34   02       01000        PSHS   A       *STACK X COORD
0095 7E   A8D7     01010        JMP    $A8D7   *GTO ROM ROUTINE
0098 A6   84       01020 SETRET LDA    ,X      *WE ARE BACK!!!! X=SCREEN LOC TO WORK ON
009A 9A   86       01030        ORA    $86     *SET BIT INDICATED BY ROM ROUTINE
009C A7   84       01040        STA    ,X      SAVE BACK ON SCREEN
009E 35   86       01050        PULS   A,B,PC  *GET X AND Y COORDS BACK AND QUIT SET ROUTINE
                   01060 *************************
                   01070 *RESET ROUTINE, WORKS   *
                   01080 *ALMOST THE SAME AS SET *
                   01090 *************************
00A0 34   06       01100 RESET  PSHS   A,B     *SAVE A AND B
00A2 8E   00AC     01110        LDX    #RSRET  *RETURN ADDRESS
00A5 34   10       01120        PSHS   X       *SAVE RETURN ADDRESS
00A7 34   02       01130        PSHS   A       *SAVE X COORD
00A9 7E   A8D7     01140        JMP    $A8D7   *CALL ROM ROUTINE
00AC BD   A8B5     01150 RSRET  JSR    $A8B5   *CALL SECOND ROM ROUTINE TO RESET
00AF 35   86       01160        PULS   A,B,PC  *WASN'T THAT EASY!
00B1               01170 SNAKE  RMB    20
          0000     01180        END
```

Listing 2:

```
                   00010 *************************
                   00020 *51 BY 24 COLUMN DRIVER *
                   00030 *TO BE CALLED FROM BASIC*
                   00040 *WITH A USR FUNCTION    *
                   00050 *************************
7000               00060        ORG    $7000
7000 4D            00070 START  TSTA           *NUMBER OR STRING IN USR?
7001 27   13       00080        BEQ    QUIT    *IF NUMBER QUIT
7003 E6   84       00090        LDB    ,X      *B=LENGTH OF PASSED STRING
7005 10AE 02       00100        LDY    2.X     *Y=START ADDRESS OF PASSED STRING
7008 5C            00110        INCB           *LEN=LEN+1 (CUE QUIT ON NO LENGTH)
7009 5A            00120 OLP    DECB           *LEN=LEN-1
700A 27   0A       00130        BEQ    QUIT    *IF DONE QUIT
700C A6   A0       00140        LDA    ,Y+     *GET FIRST CHR INTO A:Y POINTS TO NEXT CHR
700E 34   24       00150        PSHS   B,Y     *SAVE LENGTH AND LOC
7010 8D   05       00160        BSR    GO      *GO PRINT CHR$(A)
7012 35   24       00170        PULS   B,Y     *GET BACK LENGTH AND LOC
7014 20   F3       00180        BRA    OLP     *OUTPUT NEXT CHR
7016 39            00190 QUIT   RTS            *RETURN TO BASIC
                   00200 *************************
                   00210 *PRINT CHR$(A)          *
                   00220 *************************
7017 81   08       00230 GO     CMPA   #8      *BACK SPACE?
7019 26   0B       00240        BNE    NOTBS   *IF NOT BRANCH
701B 17   00E0     00250        LBSR   BACK    *MOVE CURSOR BACK 1
701E 86   20       00260        LDA    #32     *GET ASC FOR SPACE (BLANK OUT)
7020 8D   3A       00270        BSR    LETTER  *PRINT SPACE
7022 17   00D9     00280        LBSR   BACK    *BACK IT UP AGAIN
7025 39            00290        RTS            *ALL DONE BACKSPACE
7026 81   0C       00300 NOTBS  CMPA   #12     *CLEAR SCREEN?
7028 26   12       00310        BNE    NOTCL   *BRANCH IF NOT
702A 9E   BA       00320        LDX    $BA     *START OF CURRENT HIRES PAGE
702C BF   712A     00330        STX    POS     *SAVE AS CURRENT CURSOR LOCATION
702F 7F   7128     00340        CLR    BIT     *CLEAR BIT WITHIN BYTE FLAG
7032 CC   FFFF     00350 CLS    LDD    #$FFFF  *D=SOLID WHITE
7035 ED   81       00360 CLLOO  STD    ,X++    *SAVE TO SCREEN
7037 9C   B7       00370        CMPX   $B7     *AT END OF CURRENT HIRES SCREEN?
7039 26   FA       00380        BNE    CLLOO   *IF NOT GO AGAIN
703B 39            00390        RTS            *ALL DONE CLEAR SCREEN
703C 8D   1E       00400 NOTCL  BSR    LETTER  *SEND CHR$(A) TO SCREEN
703E BE   712A     00410        LDX    POS     *GET CURRENT CURSOR POS
7041 9C   B7       00420        CMPX   $B7     *AT END OF HIRES SCREEN
7043 25   16       00430        BLO    RET     *NO SCROLL NEEDED THEN
7045 30   89 FF00  00440        LEAX   -256,X  *BACK UP POINTER ONE LINE
7049 BF   712A     00450        STX    POS     *SAVE AS NEW CURSOR LOC
704C 9E   BA       00460        LDX    $BA     *GET START OF CURRENT HIRES SCREEN
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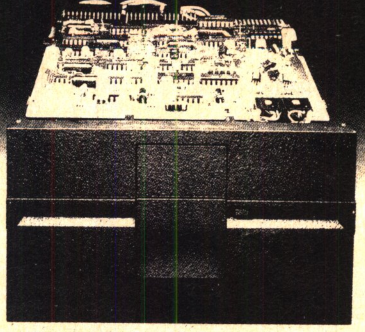

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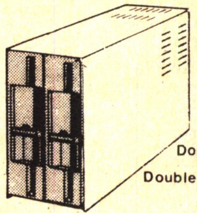

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```
704E EC    89 0100  00470 SCLOOP  LDD     256,X    *GET BYTE FROM LINE BELOW WHEREVER WE ARE
7052 ED    81       00480         STD     ,X++     *SAVE IN NEW LINE
7054 BC    712A     00490         CMPX    POS      *MOVED ALL LINES?
7057 26    F5       00500         BNE     SCLOOP   *IF NOT GO AGAIN
7059 20    D7       00510         BRA     CLS      *CLEAR LAST LINE OF SCREEN (PARTIAL CLS)
705B 39             00520 RET     RTS              *RETURN TO BASIC
705C 81    0D       00530 LETTER  CMPA    #$0D     *IS THE CHR A CARRIAGE RETURN
705E 26    0A       00540         BNE     LETT2    *IF IT ISN'T JUST OUTPUT IT
7060 7F    712B     00550         CLR     POS+1    *SET BYTE WITHIN LINE TO ZERO(LHS)
7063 7C    712A     00560         INC     POS      *POINT CURSOR TO NEXT LINE
7066 7F    7128     00570         CLR     BIT      *SET BIT WITHIN BYTE TO LHS
7069 39             00580         RTS              *RETURN
706A C6    04       00590 LETT2   LDB     #4       *4 BYTES / LETTER IN TABLE
706C F7    712C     00600         STB     BYTE     *SAVE THE NUMBER 4(NUMBER OF BYTES LEFT)
706F 80    20       00610         SUBA    #$20     *A=A-32 (ANY CONTROL CODES HAVE BEEN DONE)
7071 3D             00620         MUL              *FIND ENTRY ON TABLE
7072 C3    712D     00630         ADDD    #TABLE   *ADD TABLE OFFSET
7075 1F    02       00640         TFR     D,Y      *PUT PUT TABLE POINTER INTO Y
7077 BE    712A     00650         LDX     POS      *GET CURRENT CURSOR LOC
707A A6    A0       00660 LOOP    LDA     ,Y+      *GET BYTE FROM TABLE
707C 34    02       00670         PSHS    A        *SAVE THE BYTE
707E 8A    0F       00680         ORA     #$0F     *MAKE LSN ALL ONES
7080 8D    16       00690         BSR     SLICE    *PRINT THIS SLICE TO SCREEN
7082 35    02       00700         PULS    A        *GET BYTE BACK
7084 48             00710         ASLA             *MOVE
7085 48             00720         ASLA             *       LSN
7086 48             00730         ASLA             *       INTO
7087 48             00740         ASLA             *       MSN
7088 8A    0F       00750         ORA     #$0F     *MAKE LSN ALL ONES
708A 8D    0C       00760         BSR     SLICE    *PRINT THIS SLICE
708C 7A    712C     00770         DEC     BYTE     *NEXT BYTE TO BE DONE
708F 26    E9       00780         BNE     LOOP     *IF MORE BYTES THEN LOOP
7091 30    89 FF00  00790         LEAX    -256,X   *POINT BACK TO TOP OF LETTER
7095 8D    40       00800         BSR     FORW     *MOVE CURSOR FORWARD ONE POSITION
7097 39             00810         RTS              *RETURN
7098 F6    7128     00820 SLICE   LDB     BIT      *GET CURRENT BIT WITHIN BYTE
709B 5C             00830         INCB             *ADD ONE TO IT
709C F7    7129     00840         STB     BIT+1    *SAVE AS TEMPORARY BIT COUNTER
```

```
709F 34    02       00850         PSHS    A        *SAVE SLICE
70A1 CC    F800     00860         LDD     #$F800   *READY TO BUILD 5 BIT MASK
70A4 FD    7126     00870         STD     MASK     *SAVE AS CURRENT MASK
70A7 35    02       00880         PULS    A        *GET BACK SLICE
70A9 C6    FF       00890         LDB     #$FF     *SOLID WHITE
70AB 7A    7129     00900 BITTST  DEC     BIT+1    *BIT COUNT = BIT COUNT - 1
70AE 27    0E       00910         BEQ     SAVE     *IF ALL DONE THEN THE MASK IS READY
70B0 1A    01       00920         ORCC    #1       *SET CARRY FLAG
70B2 46             00930         RORA             *MOVE SLICE
70B3 56             00940         RORB             *       INTO 2 BYTES
70B4 1C    FE       00950         ANDCC   #$FE     *CLEAR CARRY FLAG
70B6 76    7126     00960         ROR     MASK     *MOVE MASK TO MATCH
70B9 76    7127     00970         ROR     MASK+1   *       IT IS 2 BYTES LONG
70BC 20    ED       00980         BRA     BITTST   *GO SEE IF MORE MOVEMENT IS NEEDED
70BE 34    06       00990 SAVE    PSHS    D        *SAVE SLICE(NOW USES TWO BYTES)
70C0 FC    7126     01000         LDD     MASK     *GET WORKING MASK
70C3 AA    84       01010         ORA     ,X       *WHITE OUT SCREEN SECTION
70C5 EA    01       01020         ORB     1,X      *       (IT CAN SPAN TWO BYTES)
70C7 A7    84       01030         STA     ,X       *SAVE MASK BACK TO SCREEN
70C9 E7    01       01040         STB     1,X      *       (ONCE AGAIN IT IS TWO BYTES)
70CB 35    06       01050         PULS    D        *GET BACK WORKING MASK
70CD A4    84       01060         ANDA    ,X       *SET REQUIRED BITS
70CF E4    01       01070         ANDB    1,X      *IN BOTH BYTES
70D1 ED    84       01080         STD     ,X       *SAVE TO SCREEN
70D3 30    88 20    01090         LEAX    32,X     *MOVE TO NEXT LINE
70D6 39             01100         RTS              *ALL DONE THIS SLICE
                    01110 ***************************
                    01120 *MOVE CURSOR FORWARD 5    *
                    01130 *BITS (ONE CHARACTER)     *
                    01140 ***************************
70D7 F6    7128     01150 FORW    LDB     BIT      *GET CURRENT BIT WITHIN BYTE
70DA CB    05       01160         ADDB    #5       *PLUS 5 BITS
70DC C1    07       01170         CMPB    #7       *IF MORE THAN SEVEN THEN CHANGE BYTE
70DE 23    04       01180         BLS     BITSV    *ELSE WE ARE DONE
70E0 30    01       01190         LEAX    1,X      *ADD ONE TO SCREEN LOC
70E2 C0    08       01200         SUBB    #8       *RESET BIT COUNT
70E4 C1    07       01210 BITSV   CMPB    #7       *VERY RIGHT EDGE?
70E6 26    0F       01220         BNE     BITDN1   *IF NOT THEN NO NEW LINE
```

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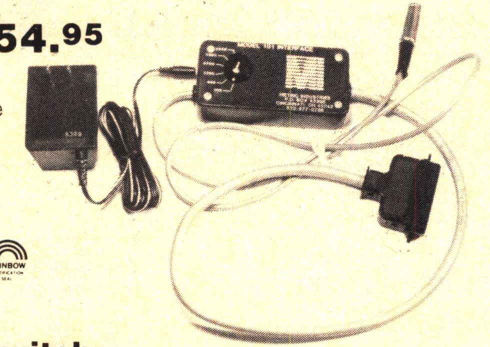

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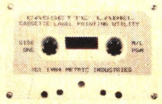

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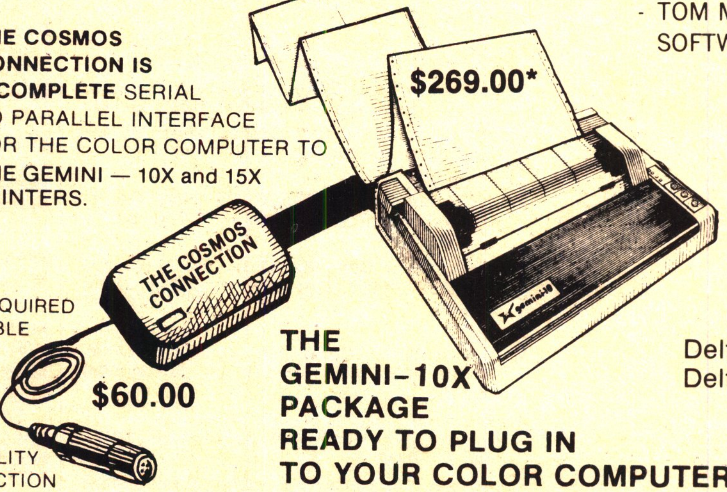
```
70E8 1E    10       01230         EXG    X,D      *PUT X WHERE WE CAN WORK ON IT
70EA C1    1F       01240         CMPB   #$1F     *VERY RIGHT OF SCREEN
70EC 26    07       01250         BNE    BITDN    *IF NOT THEN SAVE CURRENT POS
70EE 4C             01260         INCA            *ELSE NEXT LINE
70EF 5F             01270         CLRB            *AND RESET BYTE WITHIN LINE
70F0 1E    01       01280         EXG    D,X      *SWAP D AND X BACK
70F2 5F             01290         CLRB            *BIT WITHIN BYTE=0
70F3 20    02       01300         BRA    BITDN1   *GO SAVE NEW POS
70F5 1E    01       01310 BITDN   EXG    D,X      *SWAP D AND X BACK
70F7 F7    7128     01320 BITDN1  STB    BIT      *SAVE BIT WITHIN BYTE
70FA BF    712A     01330         STX    POS      *SAVE CURRENT CURSOR LOC
70FD 39             01340         RTS             *ALL DONE MOVING FORWARD
                    01350 *************************
                    01360 *MOVE CURSOR BACK 5 BITS*
                    01370 *************************
70FE 34    04       01380 BACK    PSHS   B        *SAVE B FOR CALLER
7100 F6    7128     01390         LDB    BIT      *GET CURRENT BIT WITHIN BYTE
7103 BE    712A     01400         LDX    POS      *GET CURRENT CURSOR POS
7106 C0    05       01410         SUBB   #5       *BIT=BIT - 5
7108 2A    14       01420         BPL    BACKSP   *IF STILL OK THEN SAVE IT
710A CB    08       01430         ADDB   #8       *ELSE FIX BIT COUNT
710C 30    1F       01440         LEAX   -1,X     *AND BACK UP CURSOR POS
710E 1E    10       01450         EXG    X,D      *SWAP 'EM AGAIN
7110 C1    FF       01460         CMPB   #$FF     *NEED TO MOVE TO NEW LINE?
7112 26    08       01470         BNE    BACKS1   *IF NOT SAVE NEW POS
7114 C6    1F       01480         LDB    #$1F     *END OF LINE
7116 1E    10       01490         EXG    X,D      *SWAP 'EM BACK
7118 C6    02       01500         LDB    #2       *BIT WITHIN BYTE=2
711A 20    02       01510         BRA    BACKSP   *SAVE
711C 1E    10       01520 BACKS1  EXG    X,D      *SWAP 'EM YET AGAIN
711E BF    712A     01530 BACKSP  STX    POS      *SAVE CURRENT POSITION
7121 F7    7128     01540         STB    BIT      *SAVE BIT WITHIN BYTE
7124 35    84       01550         PULS   B,PC     *RETURN
7126                01560 MASK    RMB    2        *MASK FOR STORING TO SCREEN
7128                01570 BIT     RMB    2        *BIT WITHIN BYTE
712A       0E00     01580 POS     FDB    $E00     *START OF SCREEN ($600) FOR NON-DISK
712C                01590 BYTE    RMB    1        *SLICES LEFT
712D       FFFF     01600 TABLE   FDB    $FFFF    *DATA TABLE FROM LAST MONTH
                    01610 *************************
                    01620 *DELETE THE ORG LINE    *
                    01630 *FROM LAST MONTH'S PART *
                    01640 *OF THIS PROGRAM AND RE-*
                    01650 *NUMBER IT TO START AT  *
                    01660 *1600, THEN TYPE IN THE *
                    01670 *LINES LISTED HERE UP TO*
                    01680 *LINE 1590              *
                    01690 *ASSEMBLE TO PROGRAM TO *
                    01700 *DISK OR TAPE           *
                    01710 *USE $7000 IN LINE 60   *
                    01720 *FOR 32K MACHINES OR    *
                    01730 *$3800 FOR 16K MACHINES *
                    01740 *USE THE NUMBER FROM    *
                    01750 *LINE 60 IN LINE 20 OF  *
                    01760 *THE BASIC PROGRAM AND  *
                    01770 *THE NUMBER-1 IN LINE 10*
                    01780 *OF THE BASIC PROGRAM   *
                    01790 *************************
```

Listing 3:

```
10 CLEAR1,&H6FFF:CLEAR300
20 DEFUSR0=&H7000
30 PMODE4,1:SCREEN1,1
40 A$=CHR$(12)+"Type what you wa
nt !"+CHR$(13)
50 GOSUB 90
60 A$=INKEY$:IF A$=""THEN60
70 GOSUB90:GOTO60
80 GOTO80
90 A$=USR0(A$):RETURN
```



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CoCo Community

We have compiled a list of Color Computer Clubs because of the many requests we have received. CoCo Clubs may wish to exchange newsletters, share ideas for topics of discussion at monthly meetings, etc.

Please let us know if we have omitted any clubs and send us complete up-to-date addresses. Only those clubs which have signed our "agreement form" will appear in this listing of CoCo Clubs. Also, please notify us if you wish to add or delete any names on this list. Send your information to:

CoCo Clubs
THE RAINBOW
9529 U.S. Highway 42
P.O. Box 385
Prospect, KY 40059

ALABAMA

Birmingham Alabama Color Computer Club, Robert Matthews, 1725 14th Ave. S., Birmingham, 35205, (205) 933-0887

Huntsville Color-80 Users Group, Randy Niemann, 1011 Versailles Dr., S.E., Huntsville, 35803, (205) 882-2485

ALASKA

Alaska Color Computer Users' Group, Rick McDannel, 430C Beluga Ave., Ft. Richardson, 99505, (907) 428-0392

ARIZONA

Huachuca Hot Pokers, James Standley, 235-A Jeffords Street (NBU-96H), Ft. Huachuca, 85613, (602) 458-8338

Tucson Color Computer Club, William H. Nunn, 6857 A Lighting Circle #22, Tucson, 85708

ARKANSAS

Central Arkansas CoCo Club, Melinda Braslovsky, 1203 Erving Rdg., LP Cabot, 72023, (501) 982-8854

CALIFORNIA

Color America Users Group, Mark Randall, 2227 Canyon Rd., Arcadia, 91006, (213) 355-6111

The Davis CoCoNuts, Adam Sherman, 1818 Haussler Dr., Davis, 95616, (916) 758-3195

Sacramento Color Computer Club, Wayne Chrisope, P.O. Box 9, Elverta, 95626

Joe Bennett, 1169 Florida Street, Imperial Beach, 92023, (474-6213)

Los Angeles-Wilshire Color Computer Users' Group,c/o Norm Wolfe, 269 S. Lafayette Park Pl., Los Angeles, 90057

Ventura County Color Computer Club (VC4), c/o Pete Lydall, Oxnard Public Library, 214 "C" Street, Oxnard, 93030, (805) 984-1842 or DATA (805) 984-1842

South Bay Color Computer Club, Robert L. Cakebread, P.O. Box 3540, Redondo Beach, 90277, (213) 376-1169

Sacramento CoCo Club, Charles Doughty, Box 60511, Sacramento, 95860

Salinas Color Computer Club, Larry Livingston, 501 Monterey Highway, Salinas, 93908, (408) 484-9697

Citrus Color Computer Club, Joseph Kohn, P.O. Box 6991, San Bernadino, 92412, (714) 792-8721

Local Color—A CoCo Club of San Francisco, Andrew G. Kieval, P.O. Box 421242, San Francisco, 94142

San Joaquin CoCo Club, Steven Paul Moreno, P.O. Box 99024, Stockton, 95209, (209) 951-3938

Silicon Valley Color Computer Club, Shawn Jipp, P.O. Box 61593, Sunnyvale, 94088, (408) 749-1947

CoCo Nutz Computer Club, Walter V. Seay, 68-461 Highway 86, Thermal, 92274, (619) 397-4252

COLORADO

Lowry Microcomputer Club/CoCo Users' Group, Jerry D. Surritte, 2249 Moline St., Aurora, 80010, (303) 343-3273

Colorado Color Computer Club, Joe Applegate, P.O. Box 33492, Northglenn, 80233, (303) 650-9768

FLORIDA

Northwest Florida CoCo Nuts, William N. Lamb, P.O. Box 1032, Fort Walton Beach, 32549, (904) 244-5281

Jacksonville Color Computer Club, William H. Brown III, 2411 Hirsch Ave., Jacksonville, 32216, (904) 721-0282

CoCo Chips Color Computer Club, 6 Belle Mead Circle, Largo, 33540, (813) 581-7779

Broward County Color Computer Club, Timothy D. Neary, 510 S.W. 64th Ave., Margate, 33068, (305) 972-4074

C.C. Club of Sarasota, Ernie Bontrager, 4047 Bee Ridge Rd., Sarasota, 33582, (813)921-7510

Broward CoCo Club, Sue Spahn, 11950 N.W. 29th Manor, Sunrise, 33582, (305) 741-4737

ILLINOIS

Glenside Color Computer Club, Chuck Roberg, 521 Canyon, Carol Stream, 60188, (312) 690-9374

Town & Country CoCo, 5461 S. Kenwood, Chicago, (312) 493-3748

Cook County Color Computer Club, Tim Powers, 1633 Fifth Ave., Chicago Heights, 60411, (312) 747-7062

Illinois Color Computer Club of Elgin, Steven Stroud, 1098 Florimond Dr., Elgin, 60120, (312) 695-3186

Northern Illinois Color Computer Club, 580 Milton Lane, Hoffman Estates, 60194, (312) 885-2573

Motorola Microcomputer Club, Steve Adler, 1301 Algonquin Rd., Schaumburg, 60196, (312) 576-3044

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Three Rivers Users Group, Michael Milligan, 4923 Blum Drive, Fort Wayne, 46815, (219) 485-0278

Indy Color Computer Club, Mike Davis, P.O. Box 68702, Indianapolis, 46268, (317) 257-3300

Southern Indiana Computer Club, Route 1, Box 459, Mitchell, 47446

CoCo Program, Erik Merz, 310 Appletree Dr., Noblesville, 46060, (317) 842-1340

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Metro Area Color Computer Club, K.L. Knudtzon, 3324 11th Ave., Council Bluffs, 51501

Iowa City TRS-80 Users Group, Susan Chapler, R.R. 6, The Woods, Iowa City, 52240, (319) 351-5959

KANSAS

Kansas City CoCo Club, Mike Allinder, P.O. Box 11192, Kansas City, 66111, (913) 287-1904

Topeka Color Computer Club, Kevin Cronister, 2224 Hope, Topeka, 66614, (913) 272-1353

Color Computer Club of Wichita, Rex Rivers, 1205 N. Mosley, Wichita, 67214, (316) 264-9193

Walnut Valley C.C. Users Club, David Anderson, 1212 E. 4th St., Winfield, 67156, (316) 221-0040

KENTUCKY

LOCO-COCO, Mike Standefer, 3141 Doreen Way, Louisville, 40220, (502) 458-6690

LOUISIANA

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Cajun CoCo Club, Bob Hoevel, 104 Karen St., New Iberia, 70560, (318) 365-7706

MASSACHUSETTS

Greater Boston Super Color Users Group, Robert Biamonte, 6 Boulder Drive, Burlington, 01803

New England C.C. Users Group, Christopher E. Sweet, R.D. 2, Box 261, Harvard, 01451, (617) 456-8291

Massachusetts CoCo Club, Jason Rahaim, Spring St., Lunenberg, 01462, (617) 582-6514

6809'ers, Paris Nepus, 93 Grochmal Ave., #90, Springfield, 01151, (413) 732-6633

MICHIGAN

Petoskey Area CoCo Club (PAC^3), Dennis Hoshield, 670 Liegl Drive, Alanson, 49706, (616) 347-0607

Greg Miller, P.O. Box 365, Haslett

Midland C.C. Club, Neil Drake, 709 Coolidge, Midland, 48640, (517) 631-2939

Michiana CoCo Club, Clay Howe, 310 S. Jefferson St., Sturgis, 49091, (616) 651-4248

MISSISSIPPI

Singing River C.C. Club, Henry Nielsen, 9001 Gray Ave., Ocean Spring, 39564

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North County 80 Group, Tom Vogel, 12 Ville Donna Ct., Hazelwood, 63042, (314) 739-4078

Mid-America Color Computer User's Group, Jerry Morgon, 807 Ponca Drive, Independence, 64056, (816) 796-5813

Coconuts, 1610 N. Marlan, Springfield, 65803

MONTANA

Billings C.C. Club, Jayne Kenyon, 4306 Phillip, Billings, 59101

NEW JERSEY

Intrasoft, Ravi Sakaria, 139 Candace Lane, Chatham Twp., 07928, (201) 635-8025

Bug 80 Users' Group, George R. Miller, Jr., Box 62, Glen Gardner, 08826

Loco CoCo Club, Bud Lavin, 73B Wavercrest Ave., Winfield Park, 07036

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Chaves County Color Computer Club, Lee Mitchell, 1102 Melrose Drive, Roswell, 88201, (505) 623-0789

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Queensboro Color Computer Club, Bob Rosen, Springfield Blvd. & 56th Ave., Bayside, 11364, (212) 631-6233

Local CoCo, Charles Martin, P.O. Box 901, Bellmore, 11710

Broome CoCo Club, Bucky Helmer, 57 Front St., Binghampton, 13905

Adirondack CoCo Club (Home Office), Bill Edwards, Box 365, Bolton Landing, 12814, (518) 644-9927

Adirondack CoCo Club (Albany Chapter), Ron Fish, Box 4214, Albany, 12204

Adirondack CoCo Club (Glens Falls Chapter), Dave and Richard Mitchell, 39 Center Street, Fort Edwards, 12828

Kings Byte CoCo Club, Morty Libowitz, 1063 East 84th St., Brooklyn, 11236, (212) 763-4233

C.C. Club of Central N.Y., Joseph Short, 248 S. Fourth Ave., Ilion, 11357, (315) 895-7730

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TRS-80 Users' Group of Charlotte, Jason Foodman, 240 Medearis Dr., Charlotte, 28211

Raleigh Color Computer Club, David Roper, P.O. Box 681, Garner, 27529

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CoCo Club of Youngstown, Timothy McFadden, P.O. Box 478, Canfield, 44406, (216) 788-4218

Columbus & Central Ohio Color Computer Club, D.E. Sparrow, 19 E.N. Broadway, Columbus, 43214, (614) 268-5366

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The Cleveland CoConuts, Paul Selig, 20734, Stanford Ave., Fairview Park, 44126, 333-2920

Dayton Are Color Computer Users Group, David R. Barr, 2278 Yorkshire Pl., Kettering, 45419, (513) 293-2228

M.U.G. of CoCo—Middletown Users Group, James Carr, Middletown, 45042, (513) 424-6905

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Miami Valley CoCo Club, R. Douglas Wales, 2065 LeFeure Rd., Troy, 45373

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Willamette Valley CoCo Users, Brian James, P.O. Box 11468, Eugene, 97440, (503) 687-9286

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Penn-Jersey Color Computer Club, P.O. Box 2742, Lehigh Valley, 18001

Capital Area TRS-80 Users Group, David Morrow, 340 Lewisberry Rd., New Cumberland, 17070, BBS (717) 774-6543

Pittsburgh Color Group, William Tucker, P.O. Box 351, West Mifflin, 15122, (412) 466-3078

RHODE ISLAND

New England CoCo Nuts, P.O. Box 6604, Providence, 02940

SOUTH CAROLINA

Invitation Software Group, Tom Reed, 3562 Linbrook Dr., Columbia, 29204, (803) 786-0541

Midlands 80 Computer Club, Tommy Sanders, P.O. Box 7594, Columbia, 29202, BBS (803) 755-3414

Metropolitan Greenville CoCo Club, Ed Lowe, P.O. Box 6, Gray Court, 29645, (803) 876-3928

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Spartanburg County CoCo Club, Dennis Shattuck, 473 Royal Oak Drive, Spartanburg, 29302, (803) 583-3017

TENNESSEE

Chattanooga CoCo Club, Jim Perkins/Jim Cox, P.O. Box 9825, Chattanooga, 37412, (615) 870-2439

Memphis Color Computer Users Group, Billy Seaton, P.O. Box 11736, Memphis, 38111

TEXAS

CoCo User Group, David Karam, 1809 Dexter, Austin, 78704, (512) 442-6317

B/CS Color Computer Users Group, Dale Cuthbertson, 1812 Michael Lane, Bryan, 77801, (409) 822-0731

Deer Park Color Computer Club, Donald Burr, 4314 W. Grant, Deer Park, 77536, (713) 479-5313

International Color Computer Club, Inc., Robert L. Garrett, 2101 East Main Street, Henderson, 75652, (214) 657-7834

UTAH

Ogden CoCo, Kathy Rush, 4535 S. 2600 W. Roy, Ogden, 84067

VIRGINIA

D.C./N. VA. C.C. Club, Jack Darling, 43 Donovan Dr., Alexandria, 22306, (703) 780-6159

Northern Virginia C.C. Club, Logan McMinn, 6048 Belleview Dr., Apt. 1, Falls Church, 22041

Central Virginia Color Computer Club, Lane Lester, 413 Woodland Circle, Lynchburg, 24502, (804) 237-4188

WASHINGTON

Northwest Computer Club, Judy Gehman, E. 14012 Cataldo, Spokane, 99216, (509) 928-2169

WEST VIRGINIA

Kanawha Valley Personal Computer Club, P.O. Box 5354, Charleston, 25311, BBS (304) 925-3338 or 345-6502

Mtn. State CoCo Users Group, Donald G. Barber, Jr., P.O. Box 1084, Morgantown, 26507, (304) 599-4493

Mil-O-Bar C. C. Club, Jim Lemaster, Ona, 25545, (304) 743-4752

Blennerhassett CoCo Club, David Greathouse, Rt. 9, Box 119, Parkersburg, 26101

West Virginia Color Computer Club, William Mucklow, 949 Baier Street, St. Albans, 25177, (304) 727-6764

WISCONSIN

CoCo-MUG, Tom Fandre, P.O. Box 10152, Milwaukee, 53210, (414) 542-0600

Southern Wisconsin CoCo Club, David C. Buehn, P.O. Box 411, Twin Lakes, 53181

CANADA

ALBERTA

Calgary Color Computer Club, David Logan, 151 Whitelock Place N.E., Calgary, T1Y 4S7

Medley Computer and Electronics Club, P.O. Box 1267, Medley, T4A 2M0

NEW BRUNSWICK

Moncton Colour Computer Users Group, Richard Bissett, 43 Pine Glen Rd., Riverview, E1B 1V3

BRITISH COLUMBIA

North Island CoCo Club, Brian Marshall, P.O. Box 1740, Port Hardy, B.C., V0N 2P0

NEWFOUNDLAND

Avalon CoCo Club, A.R. Thompson, 10 Foran St., St. John's, A1E 4G1

NOVA SCOTIA

Halifax Dartmouth CoCo Users Group, P.O. Box 572, Dartmough, B2Y 3Y9, (902) 469-3656

ONTARIO

International Adventurer's Club, Maurice Dow, 84 Camberley Cres., Brampton, L6V 3L4

K-W C.C. Club, Peter Karwowski, 23 Hudson Crescent, Kitchener, N2B 2V7

London CoCo Nuts Computer Club, Harry K. Boyce, 180 Concord Road, London, N6G 3H8, (519) 472-7706

Meadowvale Color Computer Club, Howard Porter, P.O. Box 186, Streetsville, Mississauga, L5M 2B8

Niagara Regional CoCo Club, Harry VanDyke, 7707 Jubilee Drive, Niagra Falls, L2G 7J3

QUEBEC

Montreal TRS-80 Users Group, Jacobs P.C. Bagchus, 1176 Phillips Place, Suite 201, Montreal, H3B 3C8, (514) 861-3488

South Shore CoCo Club, Jacques Bedard, 33 Lisilre, St-Constant, P.Q., J0L 1X0

SASKATCHEWAN

Regina Color Computer Club, Georges Glass, 26 Tweedsmuir Bay, Regina, S4X 2B1, (306) 949-3942

Saskatoon Color Computer Club, Guy Tomashewski, 415-423 Pendygrasse Rd., Saskatoon, S7M 4Z2

AUSTRALIA

Blacktown City Colour Computer Users Group, Keith Gallagher, 27 Alford St., Blacktown, New South Wales, 2148

CoCo Colyteens of Colyton, Dwayne Manson, P.O. Box 506, St. Marys, New South Wales, 2760

MEXICO

Mexico City Color Computer Club, Marcelo Luft, Laja #232, 01900 Mexico D.F., Mexico City, 5-68-78-75

WEST GERMANY

First CoCo Club Hamburg, Theis Klauberg, 2000 Hamburg 62, Bultenmoor 43

new clubs

Editor:

I am extremely pleased to announce the promotion of a new CoCo club. We are a non-profit organization with more features than I think you will find in any other CoCo club. Our club library can boast the ownership of over 300 CoCo programs and we are growing daily due to new member submissions as well as our weekly BBS hunt for new downloadable programs.

Anyone wishing to find out what owning a CoCo is all about can send a self-addressed stamped envelope to: Scarborough CoCo Club, 936 S. Wallace, 71822

Ashdown, AR

Editor:

It is with great plesure that I announce the birth of southeastern Arizona's TRS-80 Color Computer Users Group. At present, we claim 12 members. All members have upgraded memory to 64K and our systems range from cassette based to disk drive, and include both the original Color Computer and the newer CoCo II. We boast several talented programmers from our ranks and have plans to submit their work to future issues of THE RAINBOW.

We welcome correspondence from other already existing CoCo groups as well as interested inquiries from local CoCo owners. Write to: Huachuca Hot Pokers, 228B Jefferds St., 85613. Call (602) 458-0292 or 458-8338.

Tim Tulp
Ft. Huachuca, AZ

Editor:

We are organizing a TRS-80 Users Group (including CoCos) in San Luis Obispo. We will meet the third Tuesday of each month in the Radio Shack Store at 209 Madonna Road. Call Wes Porter at (805) 481-2387, or write to: 2840 Halcyon Road, 93420 for further details.

Edward Bitter
Arroyo Grande, CA

Editor:

Is there any interest in forming a Bakersfield area CoCo Users Group? Meet others with common interests and exchange ideas on software, debugging, machine language, assembly language, hardware mods, programming, hints, group purchasing, amateur radio, problem solving, etc.

For information, call or write: 2521 Bishop, Apt. A, 93306, (805) 872-8618.

Larry Sheridan
Bakersfield, CA

Editor:

I would like to start a local Los Angeles Color Computer Club for us local central Los Angeles Color Computer buffs. All the present clubs are not in the city of Los Angeles. Call (213) 464-6809.

Franz Grey
Hollywood, CA

Editor:

There is a users group in the New Haven area that has started up recently. Anyone interested in coming to the meeting, please call or write to: 544 Orange Center Road, 06477, (203) 799-2631.

Patrick Palmer
Orange, CT

Editor:

The CoCo Chips has been in existence for over a year. We have a large club library and meet once a month. The meetings are held at the Montessori School in Beleair on the first Friday of each month at 8 p.m. For further information, please contact Linda Signor at (813) 581-7779 or write to The CoCo Chips Color Computer Club, 6 Belle Meade Circle. Largo, FL 33540.

Robert Fallona
Pinellas Park, Fl

Editor:

We would like to inform you that there is a CoCo Users Group in Elgin.

We of the Illinois Color Computer Club have enjoyed your magazine articles and programs enormously. A number of us attended the RAINBOWfest and thought it was even better than the first.

At the present time we have about 22 members and meet the third Wednesday of the month at Aunt Mary's Restaurant just north of the I-90 expressway on Route 25 at 7:30 p.m.

We hope to grow in the knowledge and enjoyment of being a CoCo user as you have grown bigger and better youself. Keep up the fantastic work. Write to: 1117 Hunter Drive, 60120.

Ray Krack
Elgin, IL

Editor:

Evansville area CoCo and MC-10 users are invited to help form the Evansville CoCo Users Group. If you are interested, call me at 424-0099, or Brad Callahan at 476-9453. Brad has a BBS on this number on weekends and you can leave us a message there.

Dave Jenkins
Evansville, IN

Editor:

The Toccoa Micro-computer Society is meeting on a new schedule. The meetings are every second Tuesday evening of each month at 7 p.m. at the Toccoa-Stephens County Public Library.

Thank you for this service. I realize that it costs THE RAINBOW a considerable amount to publish a Clubs section. It is very nice of you to do this for your readers. I guess that is just one of the many reasons that THE RAINBOW is miles ahead of the other CoCo magazines.

Steve Shields
Eastonollee, GA

Editor:

The Oahu Color Computer Club meets at the Liliha Public Library in Honolulu the third Thursday of every month. All interested persons are invited to call or write: 47-164 C. Hui Akepa Place, 96744, or (808) 239-6534.

Steve Galeski
Kaneohe, HI

Editor:

I would like to inform your readers of the formation of the Lexington Color Computer Users Group. We meet the second Monday of each month. Anyone wishing more information should contact me at 224 Fairdale Drive, 40505 or call (606) 255-6007 after 6 p.m.

Ed Jelf
Lexington, KY

Editor:

I would like to know if anyone in the Ferriday-Jonesville area would be interested in starting a Color Computer Club. If so, please write me at Frogmore Pltn., 71335.

George Tanner
Frogmore, LA

Editor:

I'd like to announce the founding of the Framingham Color Computer Club. We meet at Nat Walsh Music Studio on the second and fourth Thursdays of every month. There is also a BBS run on a CoCo by the club that may be reached at (617) 872-5170.

Mitch Cohen
Framingham, MA

Editor:

I would like to inform your readers that the New England Color Computer Users Group has a new address. Our new address is: N.E.C.C.U.G., R.D. 2, Box 261, 01451. We hold meetings about once every three to four weeks and we have a newsletter that comes out every month. If you would like information on the group, please contact us.

Chris Sweet
Harvard, MA

Editor:

I would like to form a Color Computer Club in my area. I own a CoCo and I think it would be great to start a club. If you are interested, please contact me at 6321 Bosker Lane, 48444.

John Sormly
Imlay City, MI

Editor:

We are currently forming a users group in the Jefferson City area and our numbers have risen to 12 interested individuals. For more information, write to: 900 Rock Hill Road, 65101.

Wayne Johnson
Jefferson City, MO

Editor:

I have had my CoCo for about three years and I am trying to start a CoCo club in the St. Louis area.

Anyone interested call or write (314) 327-6402, 856 Hancock Road, 63385.

Any age welcome!

Kel Kerr
Wentzville, MO

Editor:

The CoCo Users Group - Monmonth/Ocean County, meets on the second Friday of every month, 7:30 p.m. at 1401 Highway 71, 07719. For more information call (201) 280-2727 or 774-7426.

John Stewart
Belmar, NY

Editor:

We are proud to announce the birth of Intrasoft, an organization for Color Computerists. Members receive: a monthly newsletter, access to the Intrasoft library (software rentals through the mail), a list of members in their area, and vast amounts of information relating to the Color Computer.

For more information, call (201) 635-8025 after 3:30 p.m. on weekdays and ask for an Intrasoft representative. The first publication of our newsletter in Dec. 1, 1984. Library opens Dec. 1, 1984.

Ravi Sakaria
Chatham, NJ

Editor:

I live in Buffalo and am finding it quite difficult to find a Color Computer Club or a modem-equipped computer buddy nearby without paying a fortune in bills.

Does anyone in the Buffalo area know of any formed users group by mail or modem? There must be someone! I'd appreciate someone calling me at (716) 822-0175, or write to 33 Fields Ave., 14210.

Dan D'Alessandro
Buffalo, NY

Editor:

A few friends and I have been considering forming a Color Computer Club in Morehead City which would serve all of eastern North Carolina. The cost would be about $4 a year and would cover such expenses as newsletters, a software library containing programs written by our members and possibly a bulletin board system containing such software. If there is anyone who might be interested in such a club, please write to me at P.O. Box 943, 28532 or call me at (919) 247-3037.

Mike Fahy
Havelock, NC

Editor:

As owners of Radio Shack's TRS-80 Color Computers, we are interested in contacting other Color Computer owners. We are located in the Asheboro-Ramseur area. Contact either John Lutsie, Rt. 9, Box 312, 27203, phone 625-5477 anytime; or phone me at 824-2612 after 3 p.m.

Helen Reynolds
Ramseur, NC

Editor:

I'd like to start a CoCo users group in the Grove City-Columbus area. Anyone interested can call me at (614) 875-9786 or write me at 2480 Northbranch Road, 43123.

Mike Gould, Jr.
Grove City, OH

Editor:

We are happy to announce the existence of the CoCo Nuts Computer Club of Portland. We invite anyone in the Portland metropolitan area to attend our meetings. We meet the first Saturday of every month at the Far West Federal Building at 45th and Woodstock. We have a very large program library on both tape and disk available to all members. We would like to exchange newsletters with any interested CoCo Clubs as we are very proud of our newsletter and very interested in finding out what other clubs are doing. Please address all inquiries and newsletters to P.O. Box 6507, 97228. Phone (503) 252-5681.

Rick Roth
Portland, OR

Editor:

We are pleased to announce the formation of the Salt City CoCo Club of Utah in Salt Lake City for users of the Color Computer.

Our group is promoting interest in the Color Computer in the Salt Lake area. Some of the areas of interest in our club are hardware experimenting, machine language programming, educating others and showing off our Color Computers to the community.

We currently publish a monthly newsletter. Articles and programs from members are included in each issue.

We meet on the even Thursdays of each month at 7 p.m. at Utah Transit Authority, 3600 S. 700 W. Anyone interested can call me at (801) 487-6032 or write to 720 E. Browning Avenue, 84105.

Dennis Mott
Salt Lake City, UT

Editor:

The Color Computer: Montgomery County Users Group (CoCo:MUG) has been formed and meets monthly at the Christiansburg Library. Our members represent a wide range of CoCo users, from educational to business applications. One member even ran a BBS, (which we are trying to convince him to restart).

Any interested parties may contact me at P.O. Box 774, 24073.

Ron Rogers
Christiansburg, VA

Editor:

Please let it be known to your readers that I am trying to start a computer club for TRS-80s. Anyone interested can contact me by writing RT. 2, Box 76-C, 25801.

Greg Reed
Beckley, WV

Editor:

I would like to announce the forming of a TRS-80 club in the New London-Hortonville area. This is a group especially for those interested in getting games and other things children would like. We will not discuss word processing and business uses, but will see how many have printers and decide to discuss that or not. We would like children from the ages 11-14, but please call for exceptions. For information write RR 4, Box 156, 54961 or call (414) 982-2565.

I would also like to have contact from other CoCo Clubs around the country, or just CoCo fans not in a club.

Paul Steinberg
New London, WI

Editor:

Over the past two years a club in Milwaukee, called CoCo-MUG, has been in full swing. For information write: CoCo-MUG, P.O. Box 10152, 53210; or call Dan at (414) 258-9448 or Tom Fandre (414) 542-0600.

Dan Neuman
Wauwatosa, WI

Editor:

A new users group is being formed, the ESSA Color Computer Club in Simcoe County, Ontario. I urge all owners or potential owners of the CoCo in the Barrie, Angus-Borden and surrounding area to come out to the club meetings.

Activities include instruction in BASIC and Assembler programming, preparing of a newsletter, general and specific discussions and any other related activities. For further information call me at (705) 424-1354 or write to P.O. Box 1001, L0M 1B0.

Eldon Doucet
Angus, Ontario

Editor:

There are a lot of Canadians up here with CoCos, and we all think that your magazine is the best!

We'd like to hear from anyone in the Bruce County area who would like to form a CoCo club or just like to share information about our favorite computer. Anyone interested can write to P.O. Box 341, N0G 2V0.

John and Mimi Wong
Walkerton, Ontario

Editor:

I am interested in joining or forming a Color Computer Club in Puerto Rico. If you have information about a club or would like to form one, please contact me at Paradis B-24, Caguas, P.R. 00625 or call (809) 743-2684.

Radames Aguayo
Caguas, P.R.

Editor:

We are proud to announce the existence of the Dutch Color Computer Club. We have given it the name COCONUT. There are almost 200 members, some of them having a Dragon computer, which we also fully support. Our library now contains approximately 2,000 programs, most of them coming from the USA.

Send correspondence to: COCONUT, c/o Peter Senff, Waterrad 104, 1613 CR Grootebroek, The Netherlands.

Peter Senff
The Netherlands

Editor:

I would like to announce that I am activating a Philatelic Users Group for stamp collectors. I have worked it out so that the membership will more than pay for itself over the course of the year. For those that are interested, write to 21531 Meyers Road, 95320.

John Root
Escalon, CA

Editor:

I would like to inform the readers about the South Bay Color Computer Club. We meet the third Friday of every month at Mercury Savings in Torrance. For more information, call (213) 376-9755 or 538-8394.

Robert Cakebread
Redondo Beach, CA

Editor:

Please inform your readers of the Dade Color Users Group of Miami. We are the largest and oldest Color Computer group in Dade County. Meetings are held at 7:30 p.m. on the third Tuesday of each month at the Miami Shores Community Center, 96th Street and Northeast 7th Avenue.

Further information may be obtained by leaving EMail on CompuServe to PPN # 70365, 463 or by calling the club BBS, 24 hours a day, (305) 751-6809.

Yearly dues are $12/individual, and $18/family.

John Lovell
Miami, FL

Editor:

The Atlanta Area Color Users Group has been in existence for three years and we now meet 10 months a year at Nash Middle School in Smyrna. Meetings begin at 7 p.m. and there are no dues at present. For more information, call Gary at 949-0369, Lee at 373-3216, or CBBS 378-4410.

Gary McConville
Douglasville, GA

Editor:

Our computer club name is Le Club d'Ordinateur Couleur de Quebec, Inc. (C.O. C.Q.).

The meetings will be every Wednesday at 7 p.m. at C.O.C.Q., Inc., Loisirs St-Mathieu, 7110, 8e Avenue, H2A 3C4.

Jean-Marie Beaujean
Montreal, Quebec

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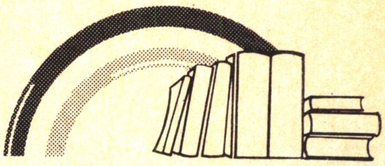

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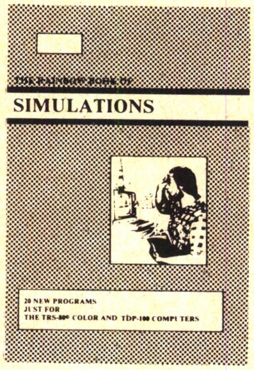
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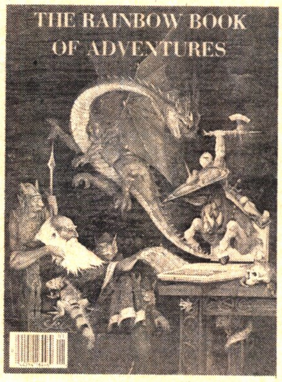
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RAINBOWTECH

DOWNLOADS

Why Not Try a 128K Upgrade Kit or VDOS?

By Dan Downard
Rainbow Technical Editor

• *Is it possible, and if so, how big a project would it be to build a plug-compatible RAM disk for the Color Computer, i.e., a RAM disk that would plug into the second connector of the standard two drive cable (for all of us who just have one drive)? Could the standard Radio Shack controller handle a RAM disk of 256K or even 512K?*

I have several software packages that will allow me to 'invert' the foreground/background on the amber monitor that I use with my Color Computer. The screen looks good with the black background and bright amber characters, but would look even better if the border was also black. Is there a way to make the entire screen (border and inner square) black and the characters amber? I have been told that since the software in question uses the Hi-Res screen (51 by 24) I'm stuck with things the way they are.

Dean C. Aukes
Carrollton, TX

Dean, have you noticed the 128K upgrade kits recently advertised in the THE RAINBOW? One of these will solve your problem without resorting to an actual RAM disk. Some software authors are approaching these upgrade kits as quasi-RAM disks. Another solution is to buy *VDOS* by Dr. Preble's Programs. This program performs exactly the function you are looking for.

(Dan Downard is an electrical engineer and has been involved in electronics for 24 years through ham radio [K4KWT]. His interest in computers began about five years ago and he has built several 68XX systems.)

As far as answering your question, we know of no practical way to use the disk controller for a RAM disk. The cable and connector are designed for a serial stream of data from a floppy disk. The data from a floppy is frequency modulated and it would seem far-out to try to emulate this signal. The several RAM disk packages for other computers we have seen replace the controller as well as the drive.

Now, for your problem with the background color of your display. It is possible to have a black screen with amber characters. The software you have just doesn't offer that option. One quick solution is to purchase the *Word-Pak* accessory from PBJ. Not only will you get a black screen with amber characters, but 80 columns to boot.

• *I have noticed that there are several expansion devices (such as voice synthesizers and Radio Shack's X-pad) that either cost extra or are not available for the CoCo 2. Is this because the CoCo 2 does not supply 12 volts to the expansion port? If this is so, why not just connect a 12-volt power supply, such as Radio Shack #273-1652 to the correct pins on the connector inside the CoCo? I am not sure of which pins to connect this to, or even if this would work at all. There are probably many CoCo 2 owners that do not like spending the extra $20 for a CoCo 2 compatible voice synthesizer or the $180 for a Multi-Pak interface. With the 12 volts, one could just get a Y-cable to connect two items to the expansion port instead of laying down big bucks for the Multi-Pak.*

Also, could two or more Y-cables be used to get several items connected to the CoCo, such as a disk drive, the X-pad and a voice synthesizer, to be used all at the same time?

Mitch Cohen
Framingham, MA

It is very easy, and practical, to attach a 12-volt power supply to your CoCo 2, Mitch. An article on how to do this appeared in Tony DiStefano's column in the April, 1984 RAINBOW. If you already have a 12-volt power supply, connect the +12 lead to Pin 2 of the expansion connector. The ground connection should be made to Pin 33 or Pin 34.

If a regulated supply is not necessary for the device you have in mind, 12 volts is available on the positive side of C3, CR3 and CR4 in the CoCo 2. Some people have been known to run their older disk controllers requiring 12 volts by connecting this line to Pin 2 of the expansion connector.

I cannot directly answer the second part of your letter dealing with multi Y-cables without knowing what the specific devices and loading characteristics you are contemplating. Keep in mind that the expansion bus on the CoCo has unbuffered lines, e.g., direct lines to the microprocessor. Putting too much load on these lines could damage the 6809E. That's why we have the Multi-Pak interface.

• *I have just discovered your very interesting magazine in my country, and am happy to read it every month.*

I have a 32K Extended Color BASIC computer. Could you tell me how random numbers can be generated in machine language? Is there a subroutine in ROM that can be called?

J. Kostense
Rotterdam, Netherlands

Nice hearing from the Netherlands, Mr. Kostense. There is a random number generating routine in the BASIC ROM. It is located at address $BF1F. Floating point math is used and we hope to have a complete explanation of how the CoCo uses this system in an upcoming issue. The explanation is too involved for this column.

- *I have two questions involving graphics. The first is about sprite graphics. Your reply to Theodore Arrington's letter implied that to have sprite graphics you need special hardware. I have used sprites on my friend's Commodore 64 and, from what I have seen, it seems like you could do the same thing with a software feature built into BASIC. How does a sprite video display generator chip work and how do you access it?*

My second question concerns graphics Adventures. I understand how you would make one with a disk system. You would design your screens and save them as binary files. On a cassette system the screens would have to be resident in memory. You would need 6K for graphics memory, which leaves you almost enough memory for nine rooms; that leaves no room for the actual Adventure. You could use BASIC statements to draw the screens as you go along, but not only would this slow down the program, it would use up just as much memory if the screens were detailed. How can cassette-based graphics Adventures store so much data into so little memory?

The Snyders
Mansfield, CT

Sprite graphics are indeed hardware generated and not possible with the 6847 VDG inside our CoCos. You are correct in assuming that sprites can be simulated with software. In fact, this is what the Extended BASIC commands *GET* and *PUT* try to accomplish.

The advantage of having hardware sprites is that less programming is required to move objects around the screen. Since the software overhead is minimal, quicker response is possible. You have to weigh this fact with the relative speed of the microprocessor though, and with our 6809E we've managed to ignore sprites so far and still have some outstanding games.

As far as saving graphics screens for games on tape, I would recommend a copy of *Bjork Blocks* distributed by Moreton Bay Software. As this program will more than adequately demonstrate, the data on graphics screens is usually highly repetitive, and can be condensed into smaller blocks.

- *In reference to the November issue of your column, a letter from John Ruzicka of Florham Park, N.J., indicated he was experiencing many crashes, I/O Errors and directory crashes.*

The problems he was experiencing were probably related to the "Tandy Gold" used on his edge connectors on the disk controller. The tin/lead contacts oxidize, causing intermittent contact problems. The alternate directory and backups are attacking the symptom, not the problem. Our Gold Plug 80, which has been on the market for several years solving the problem on the Model I computer, and for about a year and a half on the CoCo market, will eliminate the crashes and I/O Errors. The cost is minimal, and installation is fairly simple compared to trying to reconstruct one crashed directory. The Gold Plug 80 will solve the problem, not cure the symptom.

Ed Pruitt
Keller, TX

Thanks for the information, Ed. I agree with your evaluation and would recommend gold controller connectors. At the same time, it is only fair to mention that these plugs require soldering to your disk controller edge connector.

- *I am interested in how the CoCo works. I like disassembling ROMs and using some techniques in my own assembly language programs. I am a beginner at assembly language, although I'm learning fast.*

Because BASIC has to be "translated" into machine code, is there a way to intercept the machine code produced, and use it as an assembly language program? If so, would this method speed up the program?

Tim Richter
Ulster Park, NY

Tim, I believe you may be confused by the difference between a compiler and an interpreter.

The CoCo ROMs contain an interpreter. Each line of BASIC is analyzed as it is encountered, and the commands are executed by calling the proper machine language subroutine in ROM. The only reason you can't read your program in memory exactly as you typed it is due to the memory (and time) conserving method of "tokenizing" each line. "Tokenizing" refers to the substitution of all commands with a single byte (sometimes two) equivalent.

Another method of generating BASIC programs is by using a compiler. A compiler actually translates the BASIC lines into machine language before the program is executed. This results in considerably faster execution, but normally requires more memory. There are several BASIC compilers on the market for the CoCo for you to experiment with, Tim.

- *I am writing with two questions and a tip for those who wish to take advantage of it. The tip involves some cutting and soldering so some people will not want to make the modification. Those who do will also need to modify their joysticks or construct new ones.*

It seems that when Radio Shack designed the Color Computer they decided to use a six-pin socket for the joystick ports, while the joysticks themselves use only a five-pin plug. This seems rather useless on first consideration; however, for those who have such programs as Graphicom *that use the right joystick and fire button, and the left fire button, an idea springs to mind.*

If you look at the way the sockets are mounted on the board, you can see that the center pin socket is connected to ground. This center mounting pin on each socket can be cut, which will allow the fire button on each port to be cross-wired to the opposite socket. Once this has been accomplished, six-pin plugs, six-conductor wire, and a soft-touch momentary switch can be picked up at other than Radio Shack (except for the switch) electronic stores, and the joysticks rewired with both fire buttons on each joystick.

Now for the questions. I have noticed several programs lately that allow for the adjustment of the step speed of disk drives. I would like to know how this is done and if it can be accomplished through BASIC commands. Possibly the Poke? Also, how is the SAM chip programmed to flip between one 32K memory bank and the other? I can flip to the all RAM mode, but am not sure about exchanging upper and lower 32K banks without physically changing the jumper inside the machine.

Thank you kindly for paying attention, and for being part of a fine publication.

Bob Goudie
Kent, WA

Thanks for the hint, Bob. Where there's a will, there's a way.

To check the speed of your disk drives without buying OS-9, look in your August 1984 RAINBOW for an excellent program called *Disk Drive Speed Check*, by Roger Schrag. This program times the cycle produced by the index hole in the disk and converts the period encountered to RPM. Your disk drives should run at 300 RPM.

The SAM chip is programmed to page between two 32K banks of RAM by the use of the MA7 address line going to the RAM chips along with the chip select circuitry. This memory management function is all but invisible to us, as all we have to do is program the proper register to page the memory.

Your technical questions are welcomed. Please address them to: Downloads, THE RAINBOW, P.O. Box 385, Prospect, KY 40059. We reserve the right to publish only questions of general interest and to edit for space and clarity.

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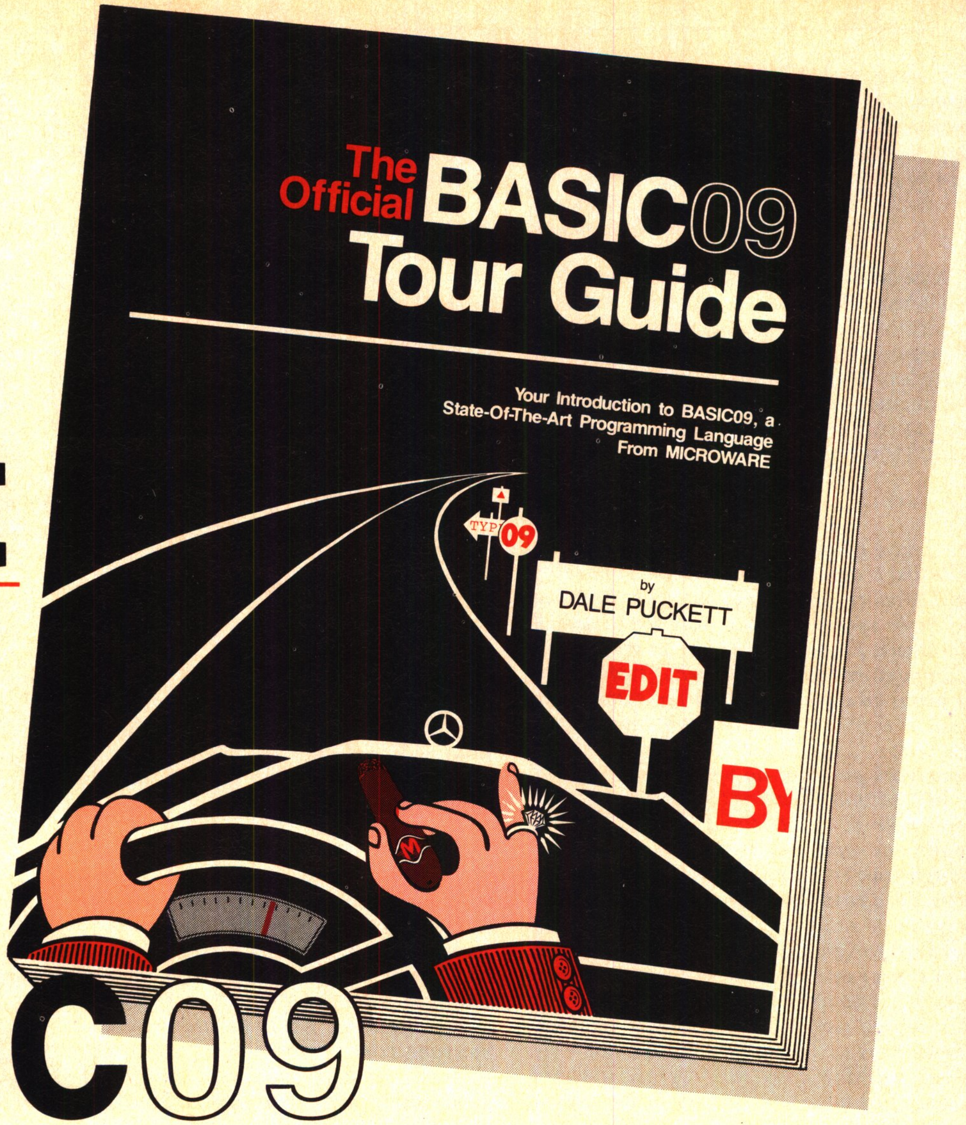
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PERSONABLE PASCAL

Block Structure And Recursion

By Daniel Adams Eastham
Rainbow Contributing Editor

For the last couple of months we have been writing programs that contain procedures and functions. Using procedures and functions allows us to break up the overall program into smaller pieces and concentrate on solving a piece of the problem at a time. However, when we use procedures and functions there is much more than this simple dividing process that is going on.

Block Structure

The body of a program, procedure or function, is referred to as a *block*. This includes both the declaration and the execution statements. While in the past we have only shown procedures and functions contained within a program, these procedures and functions can themselves have internal procedures and functions. For example:

```
PROGRAM Main;

 PROCEDURE First;

  FUNCTION LocalRoutine : Real;
  BEGIN
  END;

 BEGIN (* PROCEDURE First *)
 END;

 PROCEDURE Second;

  PROCEDURE LocalRoutine;
  BEGIN
  END;

  FUNCTION SecondFunc : Real;
  BEGIN
  END;

 BEGIN (* PROCEDURE Second *)
 END;

BEGIN (* PROGRAM Main *)
END.
```

This program contains two procedures: *First* and *Second*. The procedure *First* contains a single function *Local Routine*. The procedure *Second* contains a procedure also named *Local Routine* as well as a function named *SecondFunc*. You can see where the corresponding BEGINs are for each function by the indentation level and comments beside the BEGINs.

Scoping

In this example, only the procedures *First* and *Second* are known within the main program. All procedures and functions contained within these two procedures are local to those individual procedures and are hidden from the main program.

This means that the function *Local Routine* in the procedure *First* is known only within the procedure *First*. The procedure *LocalRoutine* and the function *SecondFunc* in the procedure *Second* are both known only within the procedure *Second*.

The area (block) within which a particular symbol (label, constant, type, variable, procedure or function) is known is called its *scope*. There are basically three *scoping rules* that determine exactly where a symbol is known:

1) A symbol is known starting at the point at which it is declared.
2) It is known only in the block within

(Daniel Eastham holds a B.S. in computer science and has 13 years experience in systems and communications programming including work on the original Telenet packet switching network. He is the author of the DEFT Pascal Workbench *and is currently president of Deft Systems, Inc.)*

which it is declared.

3) It is known within *nested* blocks as long as there are no symbols declared within those *nested* blocks which have the same name.

Using the first rule we can see that the procedure *First* is known to the procedure *Second.* However, the procedure *Second* is *not* known to the procedure *First.* This is due to the fact that *First* is declared before *Second.*

The second rule is what allows us to use the symbol *LocalRoutine* twice: once in *First* and once in *Second.* The *LocalRoutine* in *First* becomes unknown once the end of the *First* procedure is reached. It is this second rule that we have been using all along to define local variables.

We will have to use a new example to explain the third rule:

```
PROGRAM Test;

  VAR I, J : Integer;

PROCEDURE DoSomething;

  VAR I : Real;

  FUNCTION Compute (J : Real) : Real;

  BEGIN
    I := J;
  END;

BEGIN (* DoSomething *)
  I := J;
END;

BEGIN (* Test *)
I := J;
END.
```

In this example, the symbols 'I' and 'J' are each declared more than once in the program. In the main program *Test,* 'I' and 'J' are each integers declared in the main program. In the procedure *DoSomething,* 'J' is still the same integer declared in the main program, but 'I' is now a local real number variable. In the function *Compute,* 'I' is still the real number variable delared in *DoSomething,* but 'J' is now the real parameter to the function.

You can see from this that each of the *I := J* assignment statements does something different. In the first one (*Compute*), the local real parameter is assigned to the real variable declared in the enclosing procedure. In the second one (*DoSomething*), an integer declared within the program is converted to real and assigned to the local real variable. In the last one (*Test*), one integer is assigned to another integer.

These scoping rules are generally the same ones used in all *block structured* languages. Once you have learned them for PASCAL, you will also know them for PL/1, ALGOL, ADA and C.

Variable Allocation

In addition to only being known within the block in which it is declared, variables only *exist* when the block within which they are declared is active. Anytime a procedure or function is invoked that has some local variables or value parameters declared, memory is allocated for them at that time. When the procedure or function returns to the caller, the memory for the local variables is released. This form of memory allocation is known as *automatic* allocation since the memory for the variables is automatically allocated and released.

Automatic allocation results in two interesting properties of variables. First, the value that a variable has when its block is activated will not necessarily be the same value it had when that block was last activated. In fact, standard PASCAL requires that each variable be marked as undefined on entry to a block. This means that you cannot leave a value stored in a variable before exiting from a procedure and expect to use it the next time the procedure is entered.

Recursion

The second property results from the ability of a procedure or function to invoke itself. A procedure or function can do this by either invoking itself directly, or indirectly by invoking a second procedure, which eventually causes the first one to be invoked again. A procedure or function which does this is said to be *recursive.*

When a procedure or function is recursively activated, each activation of that procedure or function has its own set of local variables and value parameters. For example:

```
FUNCTION Factorial (Number :
  Integer) : Integer;
BEGIN
  IF Number<0 THEN Factorial:=0
  ELSE IF Number=0 THEN Factorial
    := 1
  ELSE Factorial := Number *
  Factorial (Number - 1);
END;
```

Factorial is an integer function which returns the factorial of its parameter. In this case, *Number* is a value parameter which is allocated each time the function is activated.

For example, if the initial call is with the number 5, *Number* will be allocated and the value 5 will be stored in it. As you can see from the IF statement, this will cause *Factorial* to invoke itself with the value of 5-1 or 4. This causes *Number* to be allocated again with the value 4 being stored into it.

This process continues until there are six separate memory locations allocated for *Number* with the values 5, 4, 3, 2, 1 and 0. At this point the function does not invoke itself again, but rather returns the value 1. This, in turn, causes the multiplication of each of the other activations to complete until the final value (1*1*2*3*4*5 = 120) is computed.

Note that *reference* parameters do *not* get allocated when a procedure or function is invoked. This is because they refer directly to a variable named by the caller. Only *value* parameters and local variables are automatically allocated.

Example Program

Although the above example demonstrates how recursion works, a recursive technique is not the best method for computing factorials. Instead, an *iterative* technique (using a *FOR* loop) would normally be used. However, when dealing with computer languages or artificial intelligence, recursive techniques can be very helpful.

This month we have a direct entry calculator program. This program lets the user directly enter a general arithmetic expression which is then evaluated using precedence rules (multiplication and division before addition and subtraction), and the use of parentheses. For example, it can correctly handle the following expressions:

5 + 3 * 4	(= 17)
(5 + 3) * 4	(= 32)
(5 + 3) / (4 - 1)	(= 2.6666. . .)

It is also able to determine if an erroneous expression was entered, and indicate exactly where in the expression the error occurred. The technique used in the program is called *recursive descent.* To use this technique we first develop a grammar for the expressions

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Some of the formatting features of XWORD include: proportional spacing supported; perfectly aligned hanging indents and columns, even when using proportional characters; full printer control with control of character size, emphasized, italics, overstrike, underlining (with or without spaces), super and sub-scripts; up to 10 header/footers; page numbering in decimal or Roman numerals; margins and headers can be set differently for even and odd pages; automatically reads printer initialization file to define XWORD for your printer (many included, and easy to write or modify your own). Many more features.

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that we are going to parse:

```
<expression> ::= <term>
  [ <addop> <term> ]
<term>::=<factor>
  [ <mulop> <factor> ]
<factor>::= <number> |
  ( <expression> )
<addop>::= + | -
<mulop>::= * | /
<number>::= legal PASCAL
  real number
```

In this case an expression is one or more terms separated with addition operators (either + or -). A term is one or more factors separated with multiplying operators (either * or /). A factor is either a real number or an expression enclosed in parentheses. This last definition makes the grammar recursive. That is, the grammar is defined in terms of itself.

The program is written with a function for each level of expression. An *Expression* function adds and subtracts terms, a *Term* function multiplies and divides factors, and a *Factor* function evaluates real numbers and handles expressions within parentheses.

The name *recursive descent* comes from the fact that we descend down the grammar until we reach a place that references one of the higher elements in the grammar. At this point we recursively invoke the higher level routine that handles this element. In this case, it is the *Factor* function that invokes the *Expression* function, causing *Expression* to be recursively activated.

In addition to using recursion, this program also takes advantage of PASCAL's block structure by placing the *Factor* function inside the *Term* function, which itself is in the *Expression* function. This means that only *Expression* is known in the main program. This prevents a programmer from accidentally invoking the *Term* or *Factor* functions.

If you have any questions about block structure or recursion in PASCAL, you may call (301) 253-1300 during normal business hours for help. Next month we will go into detail about pointers and the heap in PASCAL.

If you have a disk system, these commands are needed prior to loading the program:

```
PCLEAR 1
FILES 0,0
CLEAR 16, 4999
```

The listing:

```
00 0000   (***************************************************************
00 0000   *
00 0000   *   This program uses a recursive descent technique to
00 0000   *   evaluate arithmetic expressions.  After executing the
00 0000   *   program, just enter an arithmetic expression and ENTER.
00 0000   *   It will display the answer or the word ERROR and indicate
00 0000   *   where the error is.  To exit, just hit ENTER at the prompt.
00 0000   *
00 0000   ***************************************************************)
00 0000
00 0000   PROGRAM Calculator (Input, Output);
00 0000
00 0000   VAR CharCount : Integer;
00 0000       Value     : Real;
00 0000       ThisChar  : Char;
00 0000
00 0000   (***************************************************************
00 0000   *
00 0000   *   Routine to Parse an Expression
00 0000   *
00 0000   ***************************************************************)
00 0000
00 0000   FUNCTION Expression (VAR Result : Real) : Boolean;
10 0003
10 0003   VAR TermAmount : Real;
10 0003       Operator   : (OpAdd, OpSubtract);
10 0003
10 0003   (***************************************************************
10 0003   *
10 0003   *    Local Routine within Expression to Parse a Term
10 0003   *
10 0003   ***************************************************************)
10 0003
10 0003   FUNCTION Term (VAR Result : Real) : Boolean;
20 0006
20 0006   VAR FactorAmount : Real;
20 0006       Operator     : (OpMultiply, OpDivide);
20 0006
20 0006   (***************************************************************
20 0006   *
20 0006   *   Local Routine within Term to Parse a Factor
20 0006   *
20 0006   ***************************************************************)
20 0006
20 0006   FUNCTION Factor (VAR Result : Real) : Boolean;
30 0009
30 0009   VAR MinusFlag   : Boolean;
30 0009       Number      : String;
30 0009   BEGIN
31 0010     Factor := False;
31 0014     MinusFlag := False;
31 0018
31 0018     REPEAT
31 0018       READ (ThisChar);
31 0032       CharCount := CharCount + 1;
```

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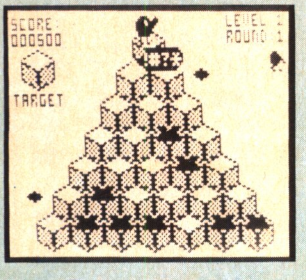

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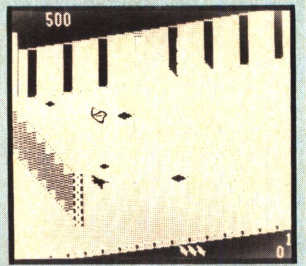

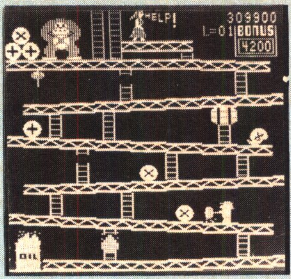

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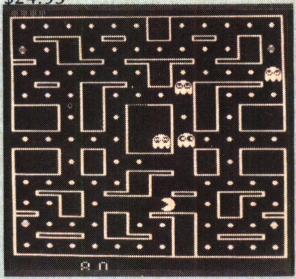

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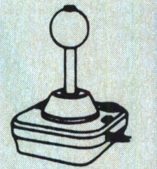

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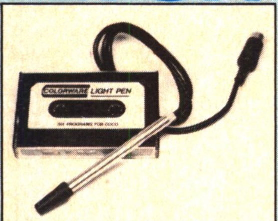

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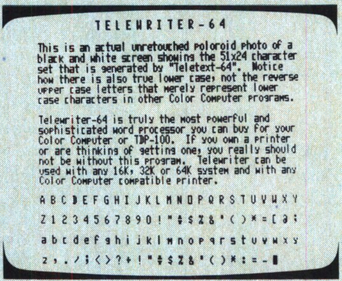

```
TELEWRITER-64

This is an actual unretouched poloroid photo of a
black and white screen showing the 51x24 character
set that is generated by "Teletext-64".  Notice
how there is also true lower case, not the reverse
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used with any 16K, 32K or 64K system and with any
Color Computer compatible printer.

A B C D E F G H I J K L M N O P Q R S T U V W X Y
Z 1 2 3 4 5 6 7 8 9 0 ! " # $ % & ' ( ) * = [ @ ;
a b c d e f g h i j k l m n o p q r s t u v w x y
z , . / ; < > ? + ! " # $ % & ' ( ) * : = - █
```

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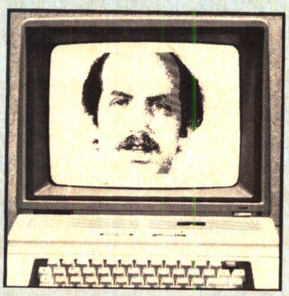

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```
31 0043      UNTIL ThisChar <> ' ';
31 0050
31 0050      IF (ThisChar = '-') OR (ThisChar = '+') THEN BEGIN
32 007E        MinusFlag := ThisChar = '-';
32 0091        REPEAT
32 0091          READ (ThisChar);
32 00AB          CharCount := CharCount + 1;
32 00BC        UNTIL ThisChar <> ' ';
32 00C9        END;
31 00C9
31 00C9      CASE ThisChar OF
31 00D1        '0', '1', '2', '3', '4', '5', '6', '7', '8', '9',
31 0122        '.' : BEGIN
32 012A                Number := '';
32 0137                REPEAT
32 0137                  Number := Number + ThisChar;
32 0154                  READ (ThisChar);
32 016E                  CharCount := CharCount + 1;
32 017F                UNTIL NOT (ThisChar IN ['0'..'9', '.', 'E']);
32 01B2                Result := ENCODEREAL (Number);
32 01D0                END;
31 01D3        '(' : BEGIN
32 01DB                IF NOT Expression (Result) THEN EXIT;
32 0202                IF ThisChar <> ')' THEN EXIT;
32 021B                READ (ThisChar);
32 0235                CharCount := CharCount + 1;
32 0246                END
31 0246        ELSE  EXIT
31 024D        END;
31 024D
31 024D      IF MinusFlag THEN Result := -Result;
31 0267
31 0267      WHILE ThisChar = ' ' DO BEGIN
32 027C        READ (ThisChar);
32 0290        CharCount := CharCount + 1;
32 02A1        END;
31 02A3
31 02A3      Factor := True;
31 02A8    END;

20 02AC    (***************************************************************
20 02AC    *
20 02AC    *   Main Entry for Term Routine
20 02AC    *
20 02AC    ***************************************************************)
20 02AC
20 02AC    BEGIN
21 02B2      Term := False;
21 02B6      IF NOT Factor (Result) THEN EXIT;
21 02D7
21 02D7      WHILE ThisChar <> CHR (13) DO BEGIN
22 02EB        CASE ThisChar OF
22 02ED          '*' : Operator := OpMultiply;
22 02FD          '/' : Operator := OpDivide
22 0305          ELSE  BEGIN
23 030D                  Term := True;
23 0312                  EXIT;
23 0316                  END
22 0316          END;
22 0316
22 0316        IF NOT Factor (FactorAmount) THEN EXIT;
22 0336
22 0336        CASE    Operator OF
22 0338          OpMultiply : Result := Result * FactorAmount;
22 035E          OpDivide   : Result := Result / FactorAmount
22 0373          END;
22 0380        END;
21 0383
21 0383      Term := True;
21 0388    END;

10 038C    (***************************************************************
10 038C    *
10 038C    *   Main Entry for Expression Routine
10 038C    *
10 038C    ***************************************************************)
10 038C
10 038C    BEGIN
11 0392      Expression := False;
11 0396      IF NOT Term (Result) THEN EXIT;
11 0397      WHILE ThisChar <> CHR (13) DO BEGIN
12 03C9        CASE ThisChar OF
12 03CB          '+' : Operator := OpAdd;
12 03DB          '-' : Operator := OpSubtract
12 03E3          ELSE  BEGIN
13 03EB                  Expression := True;
13 03F0                  EXIT;
13 03F4                  END
12 03F4          END;
12 03F4
12 03F4        IF NOT Term (TermAmount) THEN EXIT;
12 0414        CASE    Operator OF
12 0416          OpAdd       : Result := Result + TermAmount;
12 043C          OpSubtract : Result := Result - TermAmount
12 0451          END;
12 045E        END;
11 0461
11 0461      Expression := True;
11 0466    END;

00 046A    (***************************************************************
00 046A    *
00 046A    *   Main Entry for Calculator Program
00 046A    *
00 046A    ***************************************************************)
00 046A
00 046A    BEGIN
01 0470      Page;
01 047C      WRITELN;
01 0484      WRITELN ('CALCULATOR PROGRAM');
01 04A8
01 04A8      REPEAT
01 04A8        WRITE ('> ');
01 04BB        CharCount := 0;
01 04BF        IF Expression (Value) AND (ThisChar = CHR (13)) THEN
01 04EC          WRITELN ('=', Value:14:4)
01 0512        ELSE IF (CharCount > 1) OR (ThisChar <> CHR (13)) THEN BEGIN
02 0546          WRITELN (' ':CharCount, ' ^ ERROR');
02 056C          IF ThisChar <> CHR (13) THEN READLN;
02 0584          END;
01 0584      UNTIL (CharCount = 1) AND (ThisChar = CHR (13));
01 05B2    END.
```

BASIC COMPILER

MLBASIC 1.0 - BASIC COMPILER

WASATCHWARE is pleased to introduce what we feel is the most comprehensive BASIC Compiler available for the Color Computer. This BASIC compiler, called MLBASIC, is for programmers who want to create machine language from BASIC programs. Written in machine language, MLBASIC will prove to be the most powerful utility on your shelf.

COMMANDS SUPPORTED

1. I/O -Commands
CLOSE CLOADM CSAVEM DIR DRIVE DSKI$
DSKO$ FIELD FILES GET INPUT KILL
LSET OPEN PRINT PUT RSET

2. Program Control Commands
CALL END EXEC FOR STEP NEXT
GOSUB GOTO IF THEN ELSE ERROR
ON..GO RETURN STOP SUBROUTINE

3. Math Functions
ABS ASC ATN COS CNV EOF
EXP FIX INSTR INT LEN LOG
LOC LOF PEEK POINT PPOINT RND
SGN SIN SQR TAN TIMER VAL

4. String Functions
CHR$ INKEY$ LEFT$ MID$ MKN$ RIGHT$
STR$ STRING$

5. Graphic/Sound Commands
COLOR CLS CIRCLE DRAW LINE PAINT
PCLEAR PCLS PLAY PMODE PRESET PSET
RESET SCREEN SET SOUND

6. Other/Special Commands
DATA DIM LLIST MOTOR POKE READ
REM RESTORE RUN TAB VERIFY DLD
DST IBSHFT LREG PCOPY PMODD PTV
REAL SREG SWP VECTD VECTI

WASATCHWARE believes that the 6809 based microcomputer is powerful enough to warrant such a compiler. MLBASIC is a BASIC compiler that allows structured programs (using SUBROUTINEs), full floating point arithmetic and other features not available with Interpreter Basic programs.

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hogg_wash

More 128K

By Frank Hogg
Rainbow Contributing Editor

Last month, I promised I would have a program to use the 128K with FLEX. I am happy to report I have done just that. There is always a chance something will interfere with my plans, and I am glad it didn't, so on to the program.

When I first thought of doing this, I planned to use a command that worked like so: BANK alone would give you the current bank we are in. BANK 1 would switch to bank 1, BANK 1, 100 would switch to bank 1 and jump to address Hex 100. This turned out to be clumsy. First off, you never know what bank you are in unless you type BANK, and this is a pain. Second, the length of the command line is too long for heavy use. Here's an alternative. There are three commands, 'a', 'b' and 'c', all in the one program below. All of them do the same thing — they switch to either bank 0, 1 or 2. I used letters instead of numbers because they look better as the first character of the prompt. When you switch to bank 'b', for instance, the first letter of the '+++' prompt becomes a 'b', like so: 'b++'. This way, you always know what bank you are currently in. If you put a Hex number after the command, you will jump to that address. This works just like the FLEX JUMP command.

The entire program fits inside an area of memory that is empty in CC FLEX 5.0:4. The area at $FE00 to $FEFF is not used and is therefore usable for this purpose.

When first issued, BANK adds itself to FLEX's user command table and a small program initializes everything. You will see the prompt change from '+++' to 'a++' to show that we are in bank 'a'. Try typing 'b' or 'c'. Instantly the prompt changes and so does the bank.

I am presuming you have an installed and tested 128K board in your system. This program does not check for that; it just assumes it and will look the same on a system with only 64K. Let's try it out.

```
a++B
b++GET 0.ED.CMD
b++C
c++GET 0.ASM.CMD
c++A
a++
```

We now have ED in bank 'b' (1) and ASM in bank 'c' (2). This allows us to edit a program using bank 'b', assemble it using bank 'c', and then test it using bank 'a'! All without accessing the disk, except to read the file we are working with. Here's how it looks in practice.

```
a++B 0 test
b++C 3 test
c++A
a++test
```

'B 0 test' switched to bank 'b', jumped to Hex 0 where the cold start address of ED is and edited the file test. 'C 3 test' switched to bank 'c', jumped to Hex 3 where the cold start address of ASM is and assembled the program test. Then we switched to bank 'a' and ran the program to try it out. This speeds up program development like you wouldn't believe!

The pitfalls: It is important to have a program in memory before jumping to it. I speak from experience. The results can be amusing if you try it without a program in memory. One time I did this; the printer started to issue formfeeds one after another while the screen went bananas. The lesson is to make sure to have a program in the bank before you jump into it. In other words, don't jump off the cliff without someone to catch you.

Advanced Uses

How would you like to have several programs running in separate banks and switching from one to the other? Well, I took the challenge by trying to

(Frank Hogg is the president of Frank Hogg Laboratory; one of the world's largest suppliers of software for 6809 based computers. He and his wife, Linda, live in Syracuse, New York.)

have two XBASIC programs that called each other. I had to add some things to the program to save the current stack. I think you could expand on what I have done, but this does work.

First, the problems; FLEX has 48K of user memory and these banks are only 32K. That means the upper 16K of the user memory cannot be switched, only the lower 32K. Many programs use whatever user memory is available, so this could be a problem. The answer is that these same programs use FLEX's memory end pointer (MEMEND) to restrict themselves to the area available. All we have to do is set MEMEND to $7FFF, which indicates to these programs that only the lower 32K is available to them. Use the MEMEND command to set MEMEND to $7FFF, and we are all set.

```
a++MEMEND 7FFF
7FFF
a++B
b++XBASIC
READY
10 PRINT “I AM IN BANK B”
20 EXEC, “C:XBASIC”
30 PRINT “I AM BACK IN BANK B”
RUN
I AM IN BANK B
READY
10 PRINT “I AM IN BANK C”
20 EXEC, “B”
30 PRINT “I AM BACK IN BANK C”
40 GOTO 20
RUN
I AM BACK IN BANK B
READY
20 EXEC, “C”
40 GOTO 20
LIST
10 PRINT “I AM IN BANK B”
20 EXEC, “C”
30 PRINT “I AM BACK IN BANK B”
40 GOTO 20
RUN
I AM IN BANK B
I AM BACK IN BANK C
I AM BACK IN BANK B
I AM BACK IN BANK C
I AM BACK IN BANK B
I AM BACK IN BANK C
I AM BACK IN BANK B
I AM BACK IN BANK C
I AM BACK IN BANK B
I AM BACK IN BANK C
I AM BACK IN BANK B
I AM BACK IN BANK C
I AM BACK IN BANK B
```

Stop the thing by holding down the BREAK key and hitting ENTER. You could probably think of something more useful than this, but you get the idea. It would be possible to use all three banks this way, and you could even switch MEMEND up and down in one of the banks. The possibilities are interesting. At worst, you have several new ways to crash your system and, at best, you can make a powerful computer even more useful than before.

Listing 1:

```
               nam BANK.CMD
                        * Bank switch and jump command for DSL 128K on CoCo

               CD42     BETHEX  equ    $cd42
               CD03     WARMS   equ    $cd03
               CC12     UTABLE  equ    $cc12
               CC16     ESCREG  equ    $cc16
               CC4E     plus    equ    $cc4e      First '+' in '+++'
               FE00     open    equ    $fe00
               FFAC     latchc  equ    $ffac
               FFAD     latchd  equ    $ffad
               FFAE     latche  equ    $ffae
               FFAF     latchf  equ    $ffaf

FE00                            org    $fe00
FE00 00                 bank    fcb    0          Current bank we are in
FE01 0000               esctab  fdb    0          Bank 0 ESC return address
FE03 0000                       fdb    0          Bank 1 etc
FE05 0000                       fdb    0          Bank 2 etc
                        * Stack pointer holding area
FE07 0000               ststab  fdb    0          0
FE09 0000                       fdb    0          1
FE0B 0000                       fdb    0          2
                        * User command table extension
FE0D 41                 table   fcc    'A'        0
FE0E 00                         fcb    0
FE0F FE1E                       fdb    a
FE11 42                         fcc    'B'        1
FE12 00                         fcb    0
FE13 FE3E                       fdb    b
FE15 43                         fcc    'C'        2
FE16 00                         fcb    0
FE17 FE63                       fdb    c
FE19 50                         fcc    'P'        Existing P command
FE1A 00                         fcb    0
FE1B E3B8                       fdb    $e3b8
FE1D 00                         fcb    0          Ends table

                        * Bank 0 (a command)

FE1E 34   10            a       pshs   x          dummy
FE20 34   7F                    pshs   u,y,x,dp,b,a,cc save it all
FE22 8D   75   FE99             bsr    abc
FE24 10AE 84                    ldy    0,x        get bank 0's return address
FE27 10BF CC16                  sty    ESCREG     restore it
FE2B 8E   FE07                  ldx    #ststab    point to stack table
FE2E 10EE 84                    lds    0,x        reset stack pointer
FE31 7F   FE00                  clr    bank       set bank to a
                        * Switch to 0
FE34 7F   FFAE                  clr    latche
FE37 86   61                    lda    #'a        set prompt
FE39 B7   CC4E                  sta    plus
FE3C 20   48   FE86             bra    jump       go

                        * Bank 1 (b command)

FE3E 34   10            b       pshs   x          dummy
FE40 34   7F                    pshs   u,y,x,dp,b,a,cc
FE42 8D   55   FE99             bsr    abc
FE44 10AE 02                    ldy    2,x
FE47 10BF CC16                  sty    escrr
FE4B 8E   FE07                  ldx    #ststab    point to stack table
FE4E 10EE 02                    lds    2,x        reset stack pointer
FE51 86   01                    lda    #1
FE53 B7   FE00                  sta    bank       set to bank b
                        * switch to 1
FE56 7F   FFAC                  clr    latchc
FE59 7F   FFAF                  clr    latchf
FE5C 86   62                    lda    #'b
FE5E B7   CC4E                  sta    plus
FE61 20   23   FE86             bra    jump

                        * bank 2 (c command)

FE63 34   10            c       pshs   x          dummy
FE65 34   7F                    pshs   u,y,x,dp,b,a,cc
FE67 8D   30   FE99             bsr    abc
```

```
FE69 10AE 04             ldy    4,x
FE6C 10BF CC16           sty    escrr
FE70 8E   FE07           ldx    #ststab  point to stack table
FE73 10EE 04             lds    4,x      reset stack pointer
FE76 86   02             lda    #2
FE78 B7   FE00           sta    bank     set to bank c
                  * switch to 2
FE7B 7F   FFAD           clr    latchd
FE7E 7F   FFAF           clr    latchf
FE81 86   63             lda    #'c
FE83 B7   CC4E           sta    plus
                  * Jump to address on command line if there
FE86 BD   CD42    jump   jsr    GETHEX   Get address if there
FE89 25   07   FE92      blo    exit     no address
FE8B 5D                  tstb
FE8C 27   04   FE92      beq    exit
FE8E AF   6A             stx    $A,s     Where dummy was put
FE90 35   FF             puls   cc,a,b,dp,x,y,u,pc pull and goto address
FE92 8E   CD03    exit   ldx    #$cd03
FE95 AF   6A             stx    $A,s     Also where dummy was put
FE97 35   FF             puls   cc,a,b,dp,x,y,u,pc (jmp WARMS)


FE99 8E   FE07    abc    ldx    #ststab  Point to table
FE9C B6   FE00           lda    bank     get old bank
FE9F 48                  asla            mul x 2
FEA0 10EF 86             sts    a,x      store stack pointer for this bank
FEA3 8E   FE01           ldx    #esctab  Point to ESC table
FEA6 10BE CC16           ldy    ESCREG   get return address
FEAA 10AF 86             sty    a,x      save it for return to this bank
FEAD 39                  rts

             00AE size   equ    *-$fe00  Show size of main program
                  * Overlay user command table in FLEX
CC12                     org    UTABLE
CC12 FE0D                fdb    table

                  * Initialize routine (called only once)
C100                     org    $c100
C100 7F   FFAE    init   clr    latche   set to bank a
C103 86   61             lda    #'a
C105 B7   CC4E           sta    plus
C108 8E   FE07           ldx    #ststab  init stack table
C10B 10EF 84             sts    0,x
C10E 10EF 02             sts    2,x
C111 10EF 04             sts    4,x
C114 7E   CD03    theEnd jmp    WARMS

                         end    init
```

Name MEMEND.CMD

Syntax MEMEND (addr) where (addr) is a value from 0 to BFFF and is optional. In both cases the current value of MEMEND is reported.

Listing 2:

```
                  nam MEMEND.CMD
                         * Memory end report and set

                  CC2B   MEMEND  equ  $CC2B    FLEX memory end pointer
                  CD03   WARMS   equ  $CD03    FLEX return address
                  CD24   PCRLF   equ  $CD24    cr and lf
                  CD42   GETHEX  equ  $CD42    FLEX get hex number routine
                  CD45   OUTADR  equ  $CD45    output 2 hex numbers

C100                             org  $c100
C100 BD   CD42           start   jsr  GETHEX   get number to set memend to
C103 25   0B   C110              blo  report   no change
C105 5D                          tstb
C106 27   08   C110              beq  report
C108 8C   BFFF                   cmpx #$BFFF   Check for high bounds
C10B 22   03   C110              bhi  report
C10D BF   CC2B                   stx  MEMEND   set new memend

C110 8E   CC2B           report  ldx  #MEMEND
C113 BD   CD24                   jsr  PCRLF
C116 BD   CD45                   jsr  OUTADR
C119 BD   CD24                   jsr  PCRLF
C11C 7E   CD03                   jmp  WARMS

                                 end  start
```

Notes

The BANK program breaks some rules and does some things in a crude way. I will use the excuse that I wanted to keep it simple for the magazine's sake, and yours, in typing it in. The truth of the matter is that when the program started working, I stopped. The user command table in FLEX can only be extended once. It already has the 'P' command added to it. That is why I included the 'P' command in the table in this program.

The correct way would have been for the program to do this rather than the brute force method I used. If you run programs that add to the UCT, then you should run them after you run this program. Programs that add to the UCT are MCOMMAND, AUTOTASK and JCP, among others. I run the BANK command from the STARTUP file so this is never a problem. When you switch to a bank, the stack pointer is saved and the environment is pushed on the stack. Then the stack pointer for the bank we are going to use is restored, and the environment is pulled from that stack.

If the stack for both banks is the same, then the environment will be corrupted. This may be a problem with some programs. The proper way would be to save the environment in some protected area of memory. There is enough room here to do that, I just didn't get to it.

The location $FE00 contains the number of the bank we are in, either 0, 1 or 2. This can be tested from your program. It would be possible to switch banks by poking the appropriate locations in memory. If you do this, you should set $FE00 to indicate what you did for other programs to use.

You should also consider what the escape return register and the stack pointer will hold. It might be wise to use the locations in this program for that. The other use for the extra 64K, as a RAM disk may be ready by the time you read this. Contact DSL for information on that.

As a RAM disk, you could get 256 sectors of programs and data in very fast access. This is another use for the extra memory that is different than what I've done here — RGS update. The system I did this on is an older one, and the 128K upgrade is no problem. The newer CoCo 2 has some space problems, and the 128K board from RGS that I got was an early one and had some minor bugs. I have sent it back to them, so I haven't had a chance to get this program to work with it.

I don't see any problem, though. Just change the code that switches banks to the RGS board, and it should work. I will give you an update, probably next month, about this.

OS-9 UTILITY

Random Numbers For The OS-9 C Compiler

By Lew Middaugh

For want of something or the other, an empire was lost. But without a random number generator, I could not build a fantasy empire to conquer. So I wrote a random number generator.

I wrote an assembly language random number generator for the Color Computer OS-9 C Compiler. It is written to allow its addition to a user C library. This article presents this random number generator and an example of its use in a game program. Along the way I'll briefly describe what a C compiler is, and how you go about preparing an executable program with the C compiler.

How A C Compiler Works, The Background

A C compiler is nothing more than a program that translates a C language program into a 6809 assembly language program. How is the C Compiler used to prepare a C program? Figure 1 presents an overview of the steps in the process of generating an executable C program.

The first step in preparing a C program is to enter a C program using an editor. Unlike CoCo BASIC where you can just type in your program, a text editor is required to input your C program for the C compiler. The editor that is provided in the OS-9 operating system package can be used to input a C program. After your C program has been entered, it is then saved as an ASCII text file on the disk.

Once your program is safely stored on the disk, the C compiler is loaded and executed. The C compiler performs the remaining two steps in creating an executable C program.

First, the C compiler reads your program from the disk. Each line of the C program is compiled (translated) into a series of assembly language instructions. These resulting assembly language instructions are stored on the disk during compilation. Example 1 is an annotated listing of how two lines of a C program would be translated into assembly language.

The OS-9 C Compiler performs this translation process from C language to assembly language in four phases: macro pre-processing, compiler pass 1, compiler pass 2, and assembly language code optimization.

Next the OS-9 C Compiler starts the assembler program. An assembler translates the assembly language program into machine language. The assembler is loaded and executed and reads the assembly language program from the disk. During assembly the resulting executable machine code is stored on the disk.

The OS-9 C Compiler performs this process from assembly language to machine code in two phases — assembly and linking. It is the linking process that examines the C program for references to the user and system C library functions. If a reference is found, that library function is linked or added into the machine code version of the C program.

It is not necessary to completely understand assembly language programming in order to program in the C language. The programming is done in C; assembling the output of the C compiler is just a step in the translation process. However, to be effective in programming in C, it helps to understand assembly language.

Finally the C language program, now in machine code, can be loaded and executed. This whole process generates fairly fast executing machine code, in the ballpark of 10 to 100 times faster than CoCo BASIC. This is fast, but assembly language programming is still a little faster.

(Lewis Middaugh, a systems engineer at GTE, likes computers and FRP games. He is working on a fantasy game and finding this a never-ending quest.)

In summary, there are three steps in generating an executable C program. The first step is to enter the C program using a text editor. The second step is to use the C compiler to translate the lines of C program into a series of assembly language instructions. And the last step is to assemble these assembly language instructions into the binary machine code that the CoCo understands. This binary machine code is the executable version of the C program that can be loaded and executed.

Yes, it is longer and more involved than typing in a BASIC program. But the results are sometimes well worth the effort.

What Is A Library File?

In order to perform certain functions, the C compiler references a collection of commonly used position independent subroutines. These subroutines are called library routines and are contained in a library file. Routines from this file are added to your program during the assembly process.

This library file contains the mathematical and logical functions needed to execute your program. These routines include addition, division, logical *AND*, arithmetic shift, and others. It also contains the keyboard, display, and disk I/O routines, character compare routines, and initialization and exit routines. Thus, these assembly language routines provide most of the common functions needed when executing a program. It is around these functions that the compiler builds your programs. Table 1 provides a partial listing of the library routines contained in the OS-9 C library.

If a function is needed that is not in the library, the programmer has at least three options. One way is to write a subroutine in C that performs this function in terms of the available functions. Another way is to simply do without. Or, the programmer could write a new library function. This last approach is how I chose to create a random number generator function.

The Random Number Library Routine

There were two things on my mind when I started. How does one generate a random number? And how does a C program call a machine language function? With a little research and the inspection of the assembly output of the C compiler, these questions were adequately answered.

From the research I found a method of generating random numbers that is

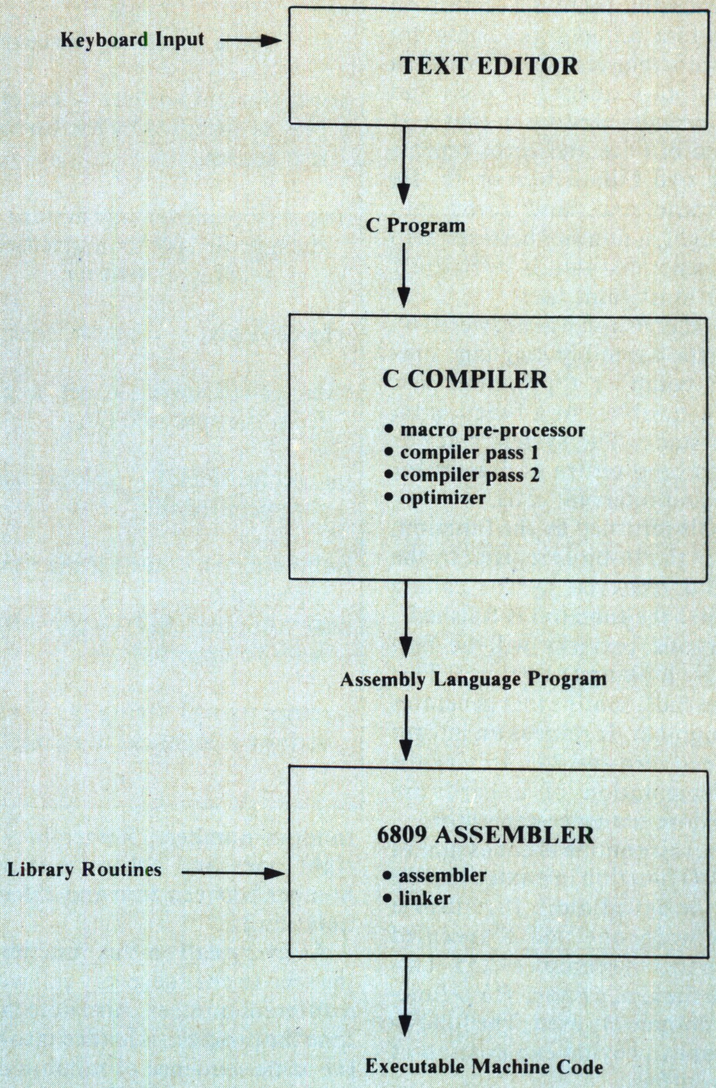

Figure 1
Generating a C Program, an Overview

Example 1
A Sample of the C Compiler Output (annotated)

```
* *      printf(“nPLAY AGAIN? (Y,N) n”);
  leax _6,pcr      get the memory address of the print string
  pshs x           save it on the system stack as required by printf()
  lbsr printf      go print the string using the library function printf()
  leas 2,s         adjust the system stack pointer to remove the string
                   address

* *      again = inkey ();
  lbsr inkey       go get the next character from the keyboard using the
                   user library function inkey ()
  stb 0,s          store the new value of ‘again’
```

simple and easy. In the *TTL Cookbook* by Don Lancaster, there is a section on pseudo-random sequencers. These are based on shift registers that provide a pseudo-random sequence of ones and zeros. It is pseudo-random in that a 31 bit sequence of ones and zeros repeats itself every two billion bits or so. By grouping these ones and zeros into groups of eight, a number between zero and 255 is generated that is sufficiently random for most game uses.

The second question was answered by examining the assembly language output of the C compiler. C programs pass arguments (variables) to a function on the system stack. The system stack is also used to hold return addresses for subroutine and interrupt calls.

If a value is returned by the function, it is placed in the 16-bit D register by the function and retrieved by the calling program after the function is finished.

These cryptic remarks will be best cleared up by looking at Listing 1. This contains the rnd() routine that generates a random number. It returns an integer value between zero and 255. It is a software implementation of a hardware pseudo-random sequence generator.

However, this routine is not as nice as CoCo's *RND* function in BASIC. Listing 2 is a routine called die(). It returns a number between one and a specified number, up to a maximum of 255. This is similar to the CoCo BASIC *RND* function as it is commonly used. The following paragraphs provide explanation of these two routines.

The rnd() Routine

Line 20 is the label for the random number routine. Its value is the starting address of the rnd() routine. The value of this label is assigned when the library routines are linked to your C program during the translation process to create a machine executable program.

The first thing that needs to be done is initialization. Line 21 causes register X to point to the seed that is used to generate the next random number. This is done using the indexed addressing mode. As register Y points to the beginning of the data area and the offset will be set during the translation process to the location of the seed in the data area, this allows this instruction to be position independent. Thus, the rnd() function can be relocated to a different address and still perform properly without reassembly.

In Line 22, register B is loaded with 8. Register B is used as a counter. When it reaches zero we will have a new 8-bit random number. (Remember, it takes eight ones and zeros to express any number between zero and 255 in binary notation.)

Table 1
Some C Library Routines

printf (format,varlist) — output variables as specified by the format to the text screen.

fileptr=fopen(filename,action) — open the specified file for a specified action, e.g., reading or writing.

fclose(fileptr) — close the specified file.

char=getc(fileptr) — get a character from the specified file.

putc(char,fileptr) — write a character to the specified file.

isalpha(char) — tests if the character is alphabetic.
char=toupper(char) — converts a character to uppercase.

strcmp(string1,string2) — checks if string1 is identical to string2.

As every call to this function causes the seed to change, every call will return a different number. Also note that every time the program is loaded into memory the same sequence of random numbers will be generated. Thus, this random number generator suffers a same drawback that the BASIC *RND* function suffers. And, likewise, some of the techniques used to randomize the BASIC *RND* function could be used to randomize the C random number generator.

Starting at the label on Line 23 through Line 30, the task is to set the carry flag based on the EXCLUSIVE-OR of bit 28 and bit 31 of the previously mentioned seed. (We are referring to the seed as if it was a big four-byte 32-bit register where bit 1 is the leftmost bit.) This is the heart of the random number generator.

Lines 31 through 34 rotate the bits of the seed to the right. This causes the contents of the carry flag to be placed into the leftmost bit of the seed as the new most significant bit.

By doing this eight times, as provided by Lines 35 and 36, the eight most significant bits of a new seed have been generated.

These bits are returned as the new random number in register D. Line 37 sets register D for return by loading D with a preset zero and the most significant byte of the random number seed. Line 38 then returns control to the calling routine.

The die() Routine

The die() routine, shown in Listing 2, scales the result of the rnd() routine to the desired range. In this, it works the same way the CoCo BASIC *RND* function works. For example, in CoCo BASIC, *RND(8)* returns a random number between one and eight. For the C language program, die(8) would also return a random number between one and eight.

How is this done? Line 24 defines the starting location of this routine. Line 25 gets a random number into the lower half of register D. (The D register is the A and B registers referenced as one register.) Line 26 loads register A with the number of sides on the die from the system stack. This number was saved on the user stack by the calling routine. The random number and the number of sides on the die are multiplied in Line 27.

To complete the scaling of the number, we need to divide the result by one more than the maximum value of the random number. This number is 256, which is also conveniently the same thing as dividing the result by two, eight times. Or by simply using the highest byte of the multiplication result in register A and ignoring the lowest byte in register B, we have effectively divided by 256. This is done in Lines 28 and 29.

The number in register B ranges from zero to one less than the number of sides of the die. Line 30 corrects this by adding one to this number in register B. Now the die roll is in register D, where the C program expects to find it on return. Then in Line 31, with its work done, the die() function returns control to the C program.

Example C Program

Three-Roll is a dice game that uses the die() routine. See Listing 3. This game is fairly simple at first glance. It is you vs. the house, which is your CoCo. And it's a tough game, with the probability entirely in favor of the house.

You get to roll a die four times adding the rolls to form a total. The house is also rolling a die, forming the house total. After each roll, you may raise your bet, which is matched by the house. After the fourth roll, if your total is higher than the house, you win the game and the pot.

However, there is one little complication. If you get six or more ahead of the house after any roll, you lose the game (and the pot!).

One small detail includes the following. In order to play, you must ante up a small amount in order to play each game of *Three-Roll.*

Three-Roll

Like PASCAL, C is also a structured programming language. In this it lends itself easily to a modular approach of program design. Structure charts can be used to help document this modularity and the interrelationships between the modules. Figure 2 presents a structure chart for the *Three-Roll* program.

As you can see, the *Three-Roll* program is broken up into five modules. The die() function used by the module roll is not shown. This function is a library function. The library functions used by *Three-Roll* are not shown.

The main module oversees the entire series of *Three-Roll* games that the user wishes to play. It initializes the number of tokens the player has to bet and determines if the the player wishes to play again. Also, if the player is low on tokens, the house (CoCo) is happy to extend credit!

The randomize module asks for an input from the keyboard. Using this input, this module calls the rnd() library function the specified number of times in order to randomize the sequence of die rolls. This is not necessarily the best technique to randomize the rnd() function, but it is usable.

The playgame module plays a single game of *Three-Roll.* It causes the new die totals to be rolled, gets the player's bets, and determines if the player (you) either won or lost. It then returns to the number of tokens the player now has to the main module.

The roll module rolls the die for the house and the player. It sums up the new totals and informs the player of the rolls and the new totals. When this is done, it returns to the playgame module with the new house and player totals.

The getbet module asks the player for his bet. If the bet is not valid, for example, if the bet is for more tokens than the player has, the player is told the number of tokens left and is asked again for a bet. After a valid bet has been entered, the module returns to playgame with the bet.

The program, *Three-Roll,* is shown in Listing 3. Using the module descriptions, most of the program lines can be followed. For further details on the C language, refer to one of the two C program language texts listed in the references.

A Loose End, The Inkey() Function

In the program listing of *Three-Roll* a function called inkey(), is used. This function is not a C function, but a library function that is included in my user library along with the die() and rnd() functions. It is not shown in the structure chart of Figure 2 as it is a library function. This function is shown in Listing 4.

Normally the C library function, getc(), or its derivative, getchar(), is used to get character input from the keyboard. This function is a line buffered read from the keyboard that returns a single character.

Thus, on the first call to getchar(), a line is read in from the keyboard. This line consists of all the characters that you typed in before pressing the ENTER key. The getchar() returns only the first character entered.

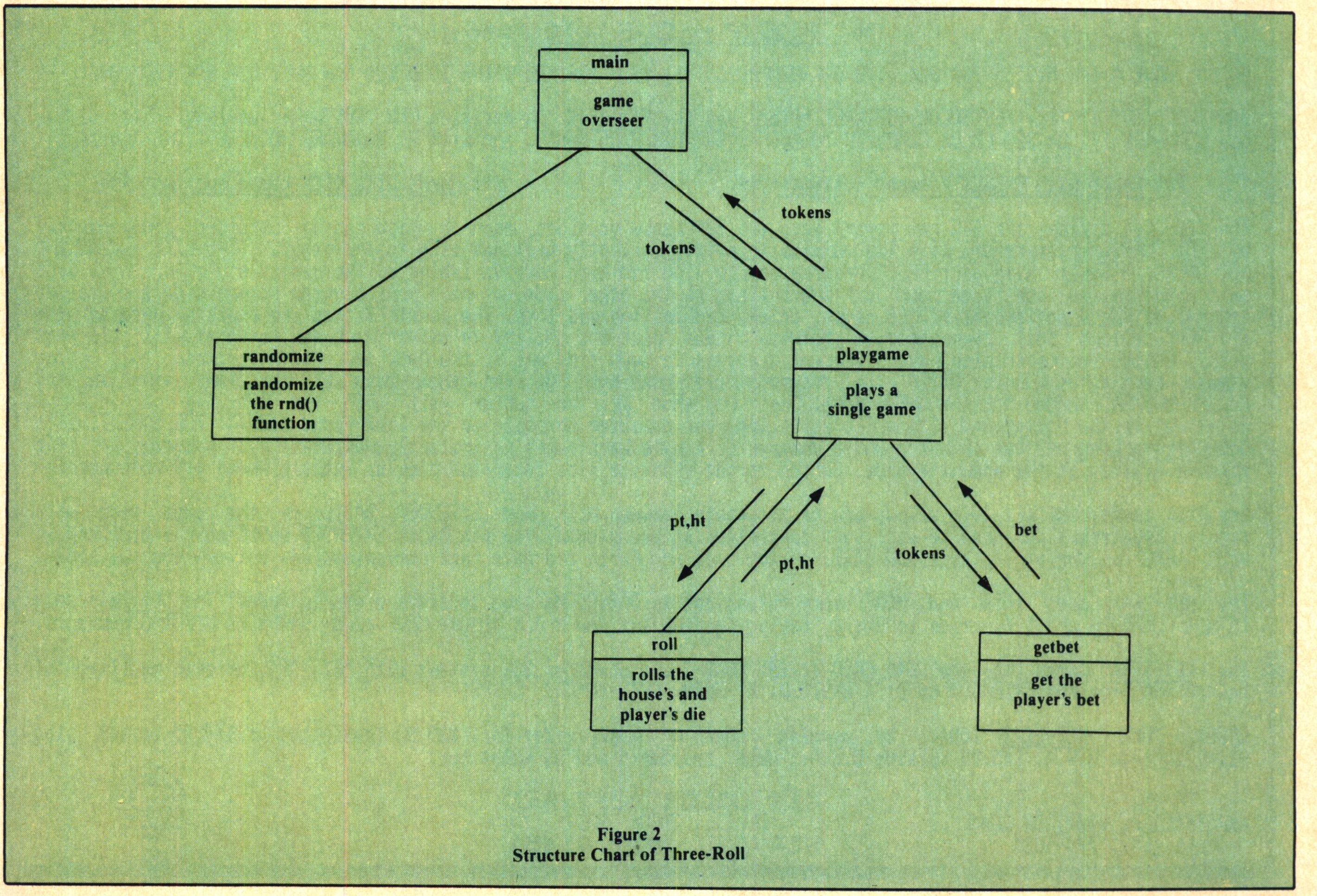

Figure 2
Structure Chart of Three-Roll

On the next call to getchar(), the second character that you entered is returned. This continues until all the characters you entered (including the ENTER key) have been returned. On the next call, another line is read in from the keyboard and the first character of the line is returned. And now the process continues as before.

What I wanted was an unbuffered, single-character read from the keyboard. In short, I wanted an *INKEY$* function somewhat like CoCo BASIC has. The inkey() function returns the character value of the next key pressed on the keyboard.

What have we accomplished? We now have a random number generator for the OS-9 C Compiler; fantasy monsters beware! You have also read an introduction on how to use a C compiler and to the concept of a library function. (In many ways, these library functions are similar to BASIC's built-in functions.) As an example of the use of this random number generator, a dice game was presented. (A perfect pastime for fantasy Adventurers relaxing in the tavern.)

References

The following references were used in understanding the C language and the application presented in this article.

Hancock, Les, *The C Primer, (A Byte Book)*, McGraw-Hill Book Company, 1982. This book is intended for programmers who know nothing about the C language. This is not a complete description of the C language, but provides the "stripped-to-essentials outline of C a beginner needs."

Kernighan, Brian W., and Ritchie, Dennis M., *The C Programming Language*, Prentice-Hall, Inc., 1978. The standard reference on the C programming language.

Lancaster, Don, *TTL Cookbook*, Howard W. Sams and Co., Inc., 1974, pages 277-281. This book describes the hardware pseudo-random sequencer on which the random number generator routine is based.

Leventhal, Lance A., *6809 Assembly Language Programming*, Osborne/McGraw-Hill, Inc., 1981. One of the earliest reference books on 6809 assembly language programming. And still one of the best.

Ley, B. James, *Computer Aided Analysis and Design for Electrical Engineers*, Holt, Rinehart, and Winston, Inc., 1970. Chapter 10 on random number generators contains a discussion of random number generators and tests that can be used to verify that a random number generator is such. Using these tests, I satisfied myself that this random number generator was adequate for game use. Further testing would be required if it is to be used for any serious application.

> *"Like PASCAL, C is also a structured programming language. In this it lends itself easily to a modular approach of program design. Structure charts can be used to help document this modularity and the interrelationships between the modules."*

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RAINBOW CERTIFICATION SEAL

Listing 1:

```
* rnd.a  -  random number generator  Ver 1.0
*    Copyright (c) 1984 by L.A.Middaugh
*    written to be included in a user library
*    for RS/Microware's  CoCo OS-9 C Compiler, Ver 01.00.00
*     Revised version of RND,  11-82  LAM
*     written for Duggar's Small C Compiler, Ver 1.0
*
* Purpose:  rnd.c generates a random number between 0 and 255.
* Call Sequence:  rn = rnd()
*    rn = value returned by rnd() function
* Initial conditions:  initial seed at label 'seed'
* Registers affected:  A,B,X
* Results:  value returned in register D.
*

                              psect rnd_a,0,0,0,0,0
0000                          nam   rnd_a
0000                          ttl   rnd

0000                rnd:
0000 30a90000                 leax  seed,y   point to seed
0004 c608                     ldb   #8       8 bits per random number
0006                loop
0006 a604                     lda   4,x      exclusive or
0008 46                       rora           bit 28 with bit 31
0009 46                       rora
000a 46                       rora
000b a804                     eora  4,x
000d 46                       rora           place result
000e 46                       rora               in carry flag
000f 6601                     ror   1,x      rotate carry into bit 0
0011 6602                     ror   2,x          as rotating entire
0013 6603                     ror   3,x          seed right
0015 6604                     ror   4,x
0017 5a                       decb           do this
0018 26ec                     bne   loop     eight times for new number
001a ec84                     ldd   0,x      get new random number
001c 39                       rts                and return

* set up a static variable for the seed
0000                          vsect
0000 00             seed      fcb   $0       zero for top half of D reg.
0001 52414e44                 fcc   "RAND"   the seed
0005                          endsect

001d                          endsect
```

Listing 2:

```
* die.a  -  die thrower  Ver 1.0
*    Copyright (c) 1984 by L.A.Middaugh
*    written to be included in a user library
*    for RS/Microware's CoCo OS-9 C Compiler,  Ver 01.00.00
*      Revised version of DIE,  11-82  LAM
*      written for Duggar's Small C Compiler, Ver 1.0
*
* Purpose:  die.a generates a random number between
*    1 and the number of sides on the die.
*    The maximum number of sides is 255.
* Call sequence:  rn = die(sides)
*    rn = value of dice roll returned
*    sides = number of sides on die
* Initial condition: second double-byte on system
*    stack contains the number of sides on the die.
* Registers affected: A,B,X
* Results: value returned in register D
*

                              psect die_a,0,0,0,0,0
0000                          nam   die_a
0000                          ttl   die

0000                die:
0000=17fffd                   lbsr  rnd   get random number into register D
0003 a663                     lda   3,s   get # of sides into accumulator A
0005 3d                       mul         now multiply them
0006 1f89                     tfr   a,b   get result divided by 256
0008 4f                       clra
0009 5c                       incb        set 1 as lowest number
000a 39                       rts

000b                          endsect

```

Listing 3:

```
/*-------------------------------------------------
   THREE-ROLL, the dice game
     Copyright (c) 1983 by L.A.Middaugh
     Version 2.0,  last revised  5 May 1983
      revised for OS-9,  30 May 1984
  ----------------------------------------------*/
#include <stdio.h>
#define INITIAL_PURSE 100
#define ANTE 1
#define OR ||
#define AND &&

int ht,pt;     /* house total, player total  */

main()
  {
  int tokens; /* number of tokens player has   */
  char again; /* play again flag               */

  randomize();
```

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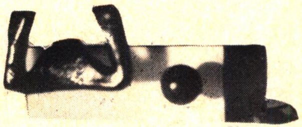

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```
  again = 'Y';
  tokens = INITIAL_PURSE;
  printf("\nYOU START WITH %d TOKENS.\n",INITIAL_PURSE);
  while ( again=='Y' AND tokens>0 )
    {
    tokens = playgame(tokens);
    printf("\nYOU NOW HAVE %d TOKENS.\n",tokens);
    printf("\nPLAY AGAIN? (Y,N) \n");
    again = inkey();
    if ( again == 'y' )  again = 'Y';
    if ( tokens<=1 AND again=='Y' )
      {
      printf("\n\nYOU CREDIT HAS BEEN EXTENDED.\n\n");
      tokens = 50;
      }
    }
  printf("\nTHANKS FOR PLAYING!\n");
  }

/*-----------------------------------------------
   Play a game routine,  4 or less die rolls
  ---------------------------------------------*/
playgame(tokens)
int tokens;
  {
  int pot,    /* total number of tokens in pot */
      diff,   /* difference in totals          */
      bet,    /* the player's bet              */
      nroll;  /* number of rolls this round    */

  printf("\nTHE ANTE IS %d.  THANK YOU!\n",ANTE);
  nroll=pot = 1;
  tokens = tokens - ANTE;
  ht=pt=diff = 0;
  roll();
  while ( nroll<4 AND diff<6 )
    {
    bet = getbet(tokens);
    pot = pot + bet + bet;
    tokens = tokens - bet;
    printf("THE CURRENT POT IS %d.\n",pot);
    roll();
    nroll++;
    diff = pt - ht;
    }
  if ( pt>ht AND diff<6 )
    {
    tokens = tokens + pot;
    printf("\nYOUR TOTAL IS GREATER\n  THAN THE HOUSE.");
    printf("\nYOU WIN !\n");
    }
  else
    {
    if ( diff>=6 )
      printf("\nYOUR TOTAL IS 6 OR MORE GREATER");
    else printf("\nYOUR TOTAL IS NOT GREATER");
    printf("\n  THAN THE HOUSE.");
    printf("\nYOU LOSE...\n");
    }
  return(tokens);
  }

/*-----------------------------------------------
   Get a valid bet from the player
  --------------------------------------------*/
getbet(tokens)
int tokens;
  {
  int bet;     /*  the player's bet            */

  bet = -1;
  while ( bet < 0 )
    {
    printf("\nYOU HAVE %d TOKENS.\n",tokens);
    printf("WHAT IS YOUR BET? (0-9) \n");
    bet = inkey() - 48;
    printf("\n");
    if ( bet>9 OR bet<0 )
      {
      printf("   THAT BET IS NOT PERMITTED.\n");
      bet = -1;
      }
    if ( bet > tokens )
      {
      printf("   BUT YOU ONLY HAVE %d TOKENS.\n",tokens);
      bet = -1 ;
```

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```
      }
    }
  return(bet);
  }

/*--------------------------------------------
    Randomize the rnd() function.
  --------------------------------------------*/
randomize()
  {
  int count,  /* Number of times to call rnd() */
      dummy;  /* A place to dump rnd() result  */

  printf("\nHIT ANY KEY TO START.\n");
  count = inkey();
  while ( count-- > 0 )   dummy = rnd();
  return;
  }

/*--------------------------------------------
   Roll the dice and total results function
  --------------------------------------------*/
roll()
  {
  int hr,pr;  /* house's roll,  player's roll */

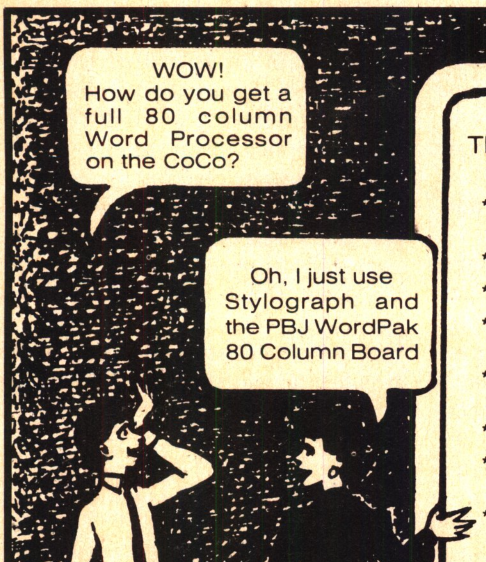
  hr = die(6);  pr = die(6);
  ht = ht + hr;  pt = pt + pr;
  printf("HOUSE ROLLS A %d\n",hr);
  printf("YOU  ROLL  A  %d\n",pr);
  printf("\n HOUSE TOTAL IS NOW %d\n",ht);
  printf("  YOUR  TOTAL IS NOW %d\n",pt);
  return;
  }

```

Listing 4:

```
.es 69
.es 71
.nf
.br
/*    Unbuffered single character input
      (see Kernighan & Ritchie, page 161)
     works much the same as CoCo BASIC INKEY$
     except it waits for next key pressed.
*/
#include <stdio.h>
#define CMASK  0377 /* for making char's >0 */

inkey()
  {
  char c;
  return( (read(0,&c,1) > 0) ? c & CMASK : EOF );
  }
```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RANDOM BASICS

Design And Development Of Application Software — Part V

By Paul Searby
Rainbow Contributing Editor

This month's article is the last in the series on design and development of application software. There could be more, but I feel that I have accomplished my goal of describing and defining a method that will assist someone involved in developing a large application system. One of the main points I hope has come across is that organization of your thoughts is critical to the success of your project. Flowchart (outline) your system before thinking about the programming. Define your file layouts and report descriptions before you start the programming. As you go through these steps, you will think of items that should be considered and included before they become programming changes. Within these articles, Random BASIC was the language selected for the programming, but with many other high level languages now available for the CoCo, another language may be more suited to your particular application.

(Paul Searby has been involved with computers and data processing since 1969, working primarily on larger IBM systems until 1975 when he bought, built and programmed the first "personal computer" ever made — an Altair 8800, which came in kit form with 1K of memory. In 1977 he left a position as project manager for a large corporation to devote his full efforts to his company, Computerware.)

It is best to complete the design, set it down for a day or two, then come back to it and make the decisions as to language and the order in which the programs should be developed. We have talked about using "Top Down" methods in our development, including the programming phase. With the same qualification I gave to doing structured programming in BASIC, we will borrow from the Top Down programming philosophy, but not strictly adhere to it. This means that we will program some of the higher levels first, but when we get to a point that we can't continue writing code that can be tested, we will succumb to the lower levels and write the code required to keep progressing at the higher levels.

Did anyone guess what the scope of our Accounts Payable System really was? Since this is the last of the articles, I will give you my best estimate of the answer. At a minimum, it is nine programs, with an estimated total size of 75K to 90K worth of code. My estimate is based on having seven different completed application systems to compare. We could write one that takes less space or possibly one or two less programs, but our original charter included both user friendliness and maintainability. To keep those and our other given guidelines, the above estimate is probably, at best, conservative. Following is a breakdown on the nine proposed programs:

1) APS100.BAS — Master File Processing (Chart 2)
2) APS120.BAS — Keyfile Generation / Reorganization
3) APS200.BAS — Invoice File Processing (Chart 3)
4) APS400.BAS — New Period Processing (Chart 4)
5) APS500.BAS — Report Requests (Chart 5)
6) APS520.BAS — Report Printing (Chart 5)
7) APS900.BAS — Utility Processing and Master Menu (Chart 6)
8) SYS100.BAS — Generalized Sort (Chart 5)

9) SYS120.BAS — Generalized Merge (Chart 5)

Several of the programs have not been mentioned much because they are what I term "system programs." They are typically included in every system, and thus do not have to be written each time. In Accounts Payable, we will have a need for the generalized sort and merge programs. These utilities are used for sorting and merging extracted files for either report or keyfile generation purposes. They can be used in any application because the calling program tells them where to return control after they are finished. Another remaining program borders on being a general purpose utility: the *Keyfile Generation and Reorganization* program. The ability to generate and reorganize the *Master's Keyfile* is required in any system that uses Keyfile access. Thus if we knew for sure that we were going to write additional applications using keyfiles, we might want to take the extra time to code *APS120.BAS* a little more general and place it in our library of SYSxxx programs.

The remaining six programs pretty much follow our flowchart. As to where to start, my choice would be parts of *APS900.BAS* (see examples), which has our top level Master Menu and many of the utilities required to get our system off the ground. Initially, I would only code the Master Menu, the System Control File creation and maintenance, the date routine and the Master, Invoice, Activity and Keyfile creation routines. The other features of *APS900* can be added at a later date. After getting this working, we can now branch out into the other programs. Next would be *Master File Processing,* since all other files are dependent on the *Master File.* Since access to the *Master* is via the *Keyfile,* we pretty much need to develop our *Master* and *Keyfile* logic together. This is where it gets nice to already have a *Keyfile Generation and Reorganization* utility. Assuming this is the first time, we will need to develop this logic as we work on the *Master* and *Keyfile* sections.

With a system that will end up being 75K to 90K in size, it is not easy to choose which examples of the coding should be included. I have chosen the "front end," being the Master Menu portion of the utility program and most of the file I/O logic of the *Vendor File Maintenance* Program. Also included is a generalized error routine that is appended to the end of each program. When you study these examples, please remember that they are only excerpts from programs, and as such have loose ends.

```
---> Master Menu Example <---
.sp2
0100 : APS900.BAS    -   A/P Master
 Menu and Utilites
0120 : (C) 1984 Computerware - V
ersion 1.0  09/25/84
0140 :
0160 LINE= 0 : STRING=24 : DIGIT
S=0 : RJUST=0
0180 ON ERROR G.9999
0200 LET Z$="APSSYS.DTA" : OPEN\
#19,Z$
0220 READ \#19,PTR,CRT,DATE,DRV1
,DRV2,DRV3,XX,OPT1,OPT2,CNAME$
0240 CLOSE \#19
0240 :
0280 LET A$=STR$(DATE) : IF DATE
 < 750000 W$=" " : G.340
0300 LET W$=MID$(A$,3,2)+"/"+MID
$(A$,5,2)+"/"+MID$(A$,1,2)
0320 :
0340 HOME
0360 LET T0=24-LEN(CNAME$)/2 : P
.TAB(T0);CNAME$
0380 PRINT TAB(12);"Accounts Pay
able System" : P.
0400 PRINT TAB(12);"System Date
is : ";W$ : P.
0420 PRINT TAB(05);"All Transact
ions Entered will use this Date"
 : P.
0440 PRINT TAB(8);" 0  Return to
 the System Menu" : P.
0460 PRINT TAB(8);" 1  Vendor Ma
ster Processing"
0480 PRINT TAB(8);" 2  Receive /
 Pay Invoices"
0500 PRINT TAB(8);" 3  New Perio
d Processing"
0520 PRINT TAB(8);" 4  Reserved"
0540 PRINT TAB(8);" 5  Report Re
quest Processing"
0560 PRINT TAB(8);" 6  Reserved"
0580 PRINT TAB(8);" 7  Reserved"
0600 PRINT TAB(8);" 8  Change th
e System Date"
0620 PRINT TAB(8);" 9  Utility P
rocessing" : P.
0640 PRINT : P.TAB(9);
0660 INPUT "Please make a select
ion...",A : P.
0680 IF A=0 C."SYS000.BAS"
0700 IF A=1 C."APS100.BAS"
0720 IF A=2 C."APS200.BAS"
0740 IF A=3 C."APS400.BAS"
0760 IF A=5 C."APS500.BAS"
0780 IF A=8 G.860
0800 IF A=9 G.1160
0820 GOTO 640
0830 :
0840 : Date Input Routine
0850 :
0860 PRINT : INPUT"Enter Month (
1 - 12)",MTH
0880 IF MTH < 1 G.860
0900 IF MTH > 12 G.860
0920 INPUT "Enter Day (1 - 31)",
DAY
0940 IF DAY < 1 G.920
0960 IF DAY > 31 G.920
0980 INPUT "Enter Year (19xx)",Y
R
1000 IF YR < 78 G.980
```

```
1020 IF YR > 99 G.980
1040 LET DATE=YR*10000+MTH*100+D
AY
1060 :
1080 LET Z$ = "APSSYS.DTA" : OPE
N\#19,Z$
1100 PUT \#19,PTR,CRT,DATE,DRV1,
DRV2,DRV3,XX,OPT1,OPT2,CNAME$
1120 CLOSE \#19 : G.300
1140 :
1160 : System Utilites Start her
e.....
1180 :
.PG
.sp
.ce
---> Vendor File Maintenance Rou
tines <---
.sp2
1000 : The folowing are routines
 out of the Vendor File Maint.
1020 : Program.  They include th
e Master File Read and Write,
1040 : along with all the Keyfil
e Search routines.  Also include
d
1060 : are the Keyfile Extract f
or a new Keyfile and the Error
1080 : routine that is common to
 each program in the System.
1100 :
1120 : As an example, to get a V
endor via the ISAM Binary Search
:
1140 :
1160 INPUT "Please enter the des
ired Vendor Name",TARG$
1180 LET LT = LEN(TARG$) : GOS.2
260 : IF HIT <> 0 G.1260
1200 PRINT : INPUT "Do you want
to try again (Y/N)",ANS$ :P.
1220 IF ANS$ = "Y" G.1160 :ELSE
exit to Menu
1240 :
1260 RECNO\#10 = KLOC : GOS.1440
 :: You now have Master!
1280 :
1300 : The Vendor Master output
(write) routine can handle both
1320 : Adds and Changes.  For an
 Add, MODESW = 1 - for a Change,
1340 : MODESW = 2.  MODESW is ac
tually the selection option from
1360 : the Vendor File Maintenan
ce Menu, serving dual purposes.
1380 :
1400 : Read Master
1420 :
1440 GET \#10,VIDX,VNUM,STINV,LS
TINV,SPARE,BEGBAL,CURIN,CURPD,YT
DPD :
1460 : LSTDT,NAME$,TITL$,ADDR$,C
TST$,PHAC,PHNUM,TERMS
1480 LET NAMSV$ = NAME$ : RET.
:: Save Vendor Name (KEY)
1500 :
1520 : Vendor Master Output Rout
ine
1540 : Find space for Master add
 in Keyfile
1560 : (VSTRT initially = start
of the Keyfile)
1580 : (Deleted Master entries h
ave their pointer negated)
1600 :
1620 IF MODESW <> 1 G.1900
1640 RECNO \#13 = VSTRT
1660 IF RECNO\#13 >= RSIZE\#13 G
.2040
1680 IF RECNO\#13 >= RNEXT\#13 R
ECNO\#10 = RNEXT\#10 : G.1780
1700 GET \#13,TEST : IF TEST >=
0 VSTRT = VSTRT+1 : G.1640
1720 : Found a spot (TEST was ne
gative)
1740 LET LOC = ABS(TEST) : RECNO
\#10 = LOC : TEST = 0
1760 PUT \#13,TEST : VSTRT = VST
RT+1
1780 LET LOC = RECNO \#10
1800 RECNO \#13 = RNEXT \#13
1820 PUT \#13,LOC,NAME$ : LIDX =
 LOC
1840 :
1860 : Write out Vendor Master
1880 :
1900 PUT \#10,VIDX,VNUM,STINV,LS
TINV,SPARE,BEGBAL,CURIN,CURPD,YT
DPD :
1920 : LSTDT,NAME$,TITL$,ADDR$,C
TST$,PHAC,PHNUM,TERMS
1940 :
1960 IF MODESW <> 2 RET. :: 2 =
change (was Key chgd?)
1980 IF NAME$ = NAMSV$ RET.
2000 PUT \#13,0 : CURPOS = RECNO
\#13 : RECNO\#13 = RNEXT\#13
2020 PUT \#13,KLOC,NAME$ : RECNO
\#13 = CURPOS : RET.
2040 :
2040 HOME : P."KEYFILE FULL - yo
u MUST reorganize the Keyfile be
fore"
2080 PRINT "you can continue usi
ng the Accounts Payable System..
"
2100 : [ here would be a GOTO to
 the Vendor Maintenance Menu ]
```

```
.PG
.SP2
2120 :
2140 : Binary Search Routine
2160 :
2180 : Entry Variables are TARG$
 and LT ( = LEN of TARG$)
2200 : OVFL = Start of Overflow
Area (in 1st Vendor Record)
2220 : Output is KLOC (Record \#
 of Master) and HIT (0 = no)
2240 :
2260 LET HIT = 0 : FIRST = 6 : L
AST = OVFL-1 : OVFLG = 0
2280 LET MID = INT((FIRST+LAST)
/ 2)
2300 RECNO \#13 = MID
2320 GOSUB 3240
2340 IF TARG$ = KEY$ G.2420
2360 IF TARG$ > KEY$ IF MID < LA
ST THEN FIRST = MID+1 : G.2280
2380 IF TARG$ < KEY$ IF MID > FI
RST THEN LAST = MID-1 : G.2280
2400 GOTO 2860
2420 LET CURPOS = RECNO \#13 : I
F CURPOS = FIRST G.2520
2440 RECNO \#13 = CURPOS-1
2460 GOSUB 3240
2480 IF TARG$ = KEY$ G.2420
2500 RECNO \#13 = CURPOS : GOS.3
240
2520 IF KLOC <= 0 GOS.3200 : G.2
520
2540 IF TARG$ = KEY$ G.2620 : EL
SE G.2860
2560 :
2580 : Got a Hit - Exit
2600 :
2620 LET HIT = 1 : RET.
2640 :
2660 : Re-entry to look for more
 with same Key
2680 :
2700 IF OVFLG > 0 G.2900
2720 GOSUB 3200
2740 IF TARG$ <> KEY$ G.2860
2760 IF LEN(VENKEY$) < 2 GOS.320
0 : ELSE G.2620
2780 GOTO 2740
2800 :
2820 : Sequential Search thru ov
erflow Area
2840 :
2860 IF OVFL >= RNEXT \#13 G.304
0
2880 RECNO \#13 = OVFL-1 : OVFLG
```

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```
 = 1
2900 GOSUB 3200
2920 IF KLOC <= 0 G.3020
2940 IF TARG$ <> KEY$ G.3020
2960 IF LEN(VENKEY$) < 2 GOS.320
0 : ELSE G.2620
2980 GOTO 2940
3000 :
3020 IF RECNO \#13 < RNEXT \#13-
1 G.2900
3040 IF HIT > 0 G.3080
3060 PRINT : P.TARG$;" was not f
ound....." : G.3100
3080 PRINT : P."That's all I hav
e!!" : P.
3100 INPUT "Press RETURN to cont
inue",A
3120 LET HIT = 0 : RET.
3140 :
3160 : Read a Record from the Ke
y file
3180 :
3200 IF RECNO\#13 >= RNEXT\#13-1
 KEY$ = "" : RET.
3220 RECNO \#13 = RECNO \#13+1
3240 GET \#13,KLOC,VENKEY$
3260 LET KEY$ = LEFT$(VENKEY$,LT
)
3280 RETURN
.PG
.SP2
3300 :
3320 : Keyfile Extract for New K
ey Generation
3340 :
3360 LET Z$ = "SYSWKS.UKY" : OPE
N\#1,Z$ : SCRATCH\#1
3380 RECNO \#10 = 1
3400 RECNO \#10 = RECNO\#10 + 1
3420 IF RECNO\#10 >= RNEXT\#10 G
.3560
3440 IF RECNO\#10 = RSIZE\#10 G.
3560
3460 GOSUB 1440 :: Read Master F
ile
3480 LET ZLOC = RECNO\#10
3500 IF LIDX = 0 THEN ZLOC = -ZL
OC  : : SHOW AS EMPTY
3520 WRITE \#1,ZLOC,NAME$
3540 GOTO 3400
3560 CLOSE \#10,\#1
3580 LET Z$ = "SYSWKS.CTL" : OPE
N\#1,Z$ : SCRATCH\#1
3600 WRITE \#1,"APS120.BAS",1,0,
0,0 : CLOSE\#1
3620 CHAIN "SYS100.BAS"
3640 :
3660 : Generalized Error Routine
3680 :
3700 IF ERCODE <> 33 G.3740
3720 PRINT "File / Program ";Z$;
" was NOT found !!"
3740 LIST \#PTR,100-140 : P.\#PT
R
3760 PRINT \#PTR,"An unrecoverab
le ERROR has been detected."
3780 PRINT \#PTR,"Please save th
e following information : " : P.
\#PTR
3800 PRINT \#PTR,"The ERROR code
 was : ";ERCODE
3820 PRINT \#PTR,"The Line Numbe
r was ";ERLINE : P.\#PTR
3840 IF ERCODE = 33 G.3880
3860 IF ERCODE > 60 G.3880 : ELS
E P.\#PTR,CHR$(12) : P.CHR$(7) :
 STOP
3880 PRINT \#PTR,"The error rela
tes to disk data file operation.
"
3900 PRINT \#PTR,"You may be abl
e to solve the problem with one
of the"
3920 PRINT \#PTR,"System Utiliti
es - going to Utility Processing
..."
3940 CHAIN "APS900.BAS"
```

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After we have a functioning *Master* and *Keyfile*, we can progress to the coding of receiving or paying invoices (Invoice File Processing). This is where a lot of our common routines come into use. We will need to develop the *Invoice File* linkage to the *Vendor Master*, but will be able to reuse the *ISAM Keyfile* lookup for the *Master File* that was developed in *APS100.BAS*. Again, I would concentrate initially on just getting the system capable of reading and writing invoice records, leaving check writers and other frills to another time. This program also needs the capability of writing out activity records. This code should be done as you are doing the adjustment and payment portions.

To really be able to check the integrity of the Accounts Payable System, we need "eyes" or reports. Thus, the next programs to tackle should be the report extract and a crude version of the report printing. Initially, these can be used to insure that the *Master*, *Invoice* and *Activity* files are getting updated properly. When I say a crude version, I mean that we are trying to implement the reports as designed, but aren't too concerned about tab settings, etc. At this point we primarily want to see the data, and can make it look prettier once we're convinced that all our update logic is working correctly. Lastly, *New Period Processing* can be coded, allowing us to reset the system and again recheck our inputs.

> ***"It is best to complete the design, set it down for a day or two, then come back to it and make the decisions as to language and the order in which the programs should be developed."***

Once we have the BASIC system operational, we can then go back and complete the remaining functions. Possibly by this time, either we have seen a need for some changes, or have shown the system to a potential customer and they have asked for some changes. If we get to this step before the complete system is programmed, the odds are that less code will have to be changed than if we wait until we are through. An item that is required, but has not been mentioned to date, is a manual. When is the best time to write the manual? Ideally, it should have been written before we started and used as a guideline while programming. In practice, it typically is written after the system is completed. A good compromise, and one that has some benefits, is to develop it while the programming is taking place. If possible, have someone else do the manual. I say this because first, programmers don't generally write good manuals (and they usually hate doing it), and secondly, if someone else is trying to explain the system, they will spot oversights that the programmer may miss. This may not be a program error as such, but more likely a clearer way to present the information.

I am looking for suggestions for subject matter to cover in future articles. The topics should be somewhat general in nature, leaving the specifics, on OS-9 as an example, to those who have columns on those subjects. If you have a suggestion, please send it to me care of Computerware, Box 668, Encinitas, CA 92024.

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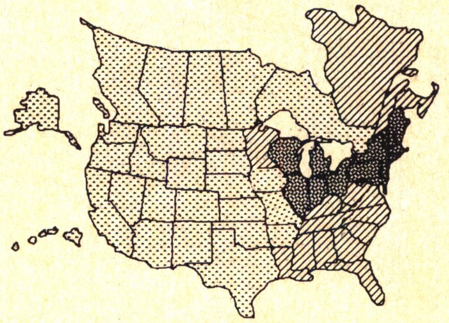

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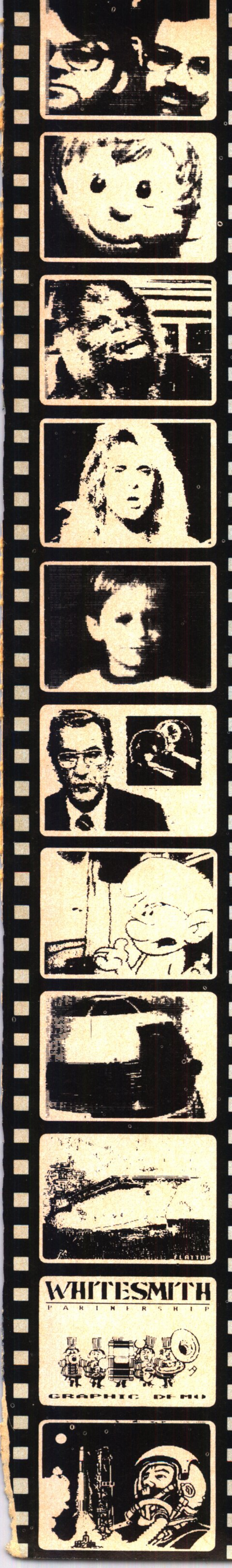
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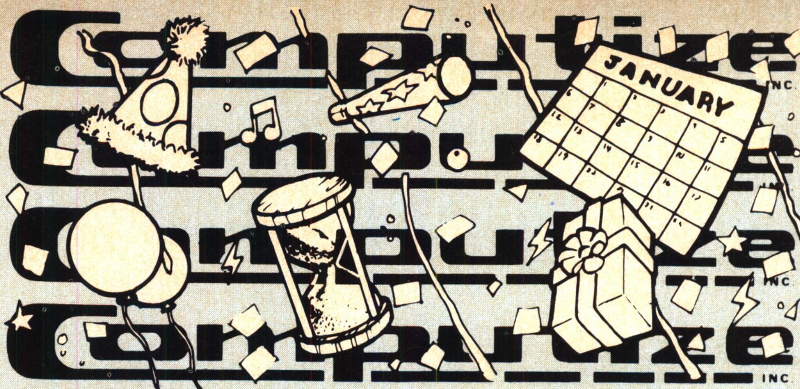
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View "off air" or "VCR" digitized video at close to real-time. "Snapshot" video frames to the digitizer's internal memory. No slow, "blurry" serial manipulation . . . just hit your joystick's fire button! It's that simple.

Use with your multi-pak or a "Y" cable ("Y" cable available at $19.95)

Video is input via a "BNC" connector. External controls for HORIZONTAL POSITION, VERTICAL POSITION, HORIZONTAL WIDTH, BRIGHTNESS, and CONTRAST (FUZZ) settings.

Don't be fooled by imitations...this is the GRAPHICOM VIDEO DIGITIZER . . . the **only** digitizer that "DIRECTLY" inputs into Graphicom (The original design by Cheshire Cat, the folks that brought Graphicom to the COCO world).

REQUIRES 64K COCO, 1 DISK DRIVE, AND 2 ANALOG JOYSTICKS. FREE GRAPHICOM PROGRAM, PICTURE DISK, AND GRAPHICOM UTILITY SUPPLIED WITH PURCHASE OF VIDEO DIGITIZER (A $50 VALUE).

PICTURE DISKS $9.95

Available from COMPUTIZE

4C	Artifact color palette
5C	Large character sets drawn with master design (from Derringer Software)
6C	Same as 5C but set up as stamp set
7	Miscellaneous Art Set #1
8	Miscellaneous Art Set #2
9	Miscellaneous Ads and Examples
10	Miscellaneous Fonts
11C	Artifact color palette type fonts
12C	Art demo from WHITESMITH
13C	GRAPHICOM PART II function demo

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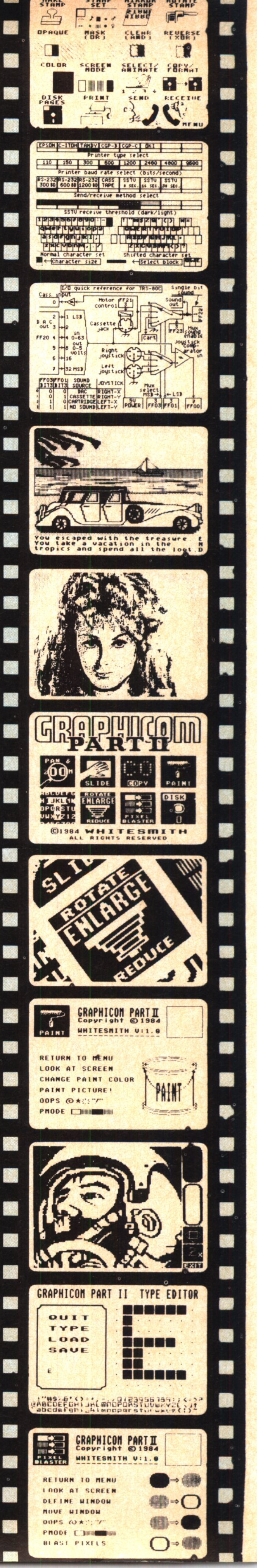
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SEND
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Printer type select
Printer baud rate select (bits/second)
Send/receive method select
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MOVE WINDOW
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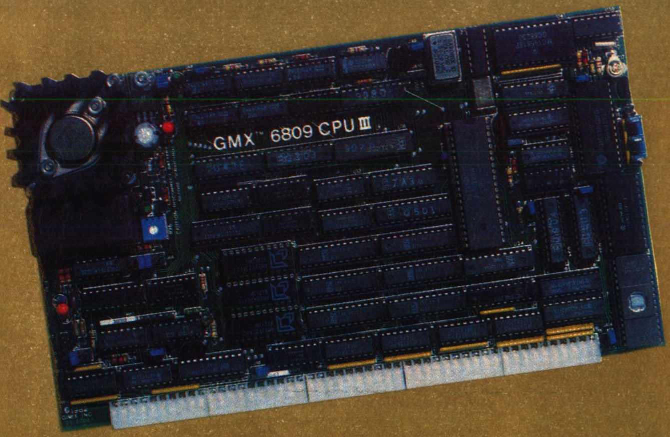
GIMIX STATE OF THE ART 6809 SYSTEMS FOR THE SERIOUS USER.



GIMIX has 19MB or high performance 47MB Winchester Drive Systems and/or Floppy Disk Drive Systems.

For the ultimate in performance, the Unique GMX 6809 CPUIII, using either OS-9-GMXIII or UniFLEX GMXIII (available shortly), gives protection to the system and other users from crashes caused by defective user programs. e.g. During program development, a programmer who crashes goes back to the shell or the debugger, while the other users are not even aware anything occurred.

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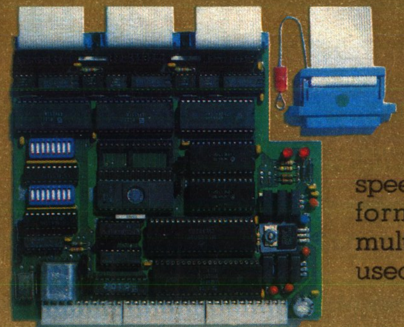

For the user who appreciates the need for a bus structured system using STATIC RAM and powered by a ferro resonant constant voltage transformer.

GIMIX has single user systems that can run both FLEX and OS-9 or Multi user systems for use with UniFLEX or OS-9.

GIMIX versions of OS9 and UniFLEX include maintenance and support by Microware (90 days) and TSC (1 year). Maintenance and support after this period are available at extra cost.

(NOTE: this support and maintenance is only for use with approved GIMIX hardware)

GIMIX 6809 systems support five predominant operating systems:

OS-9 GMX III,
OS-9 GMX II,
UniFLEX,
OS-9 GMX I,
FLEX

and a wide variety of languages and development software.

Whatever your application: software development, instrumentation, process control, educational, scientific or business; whether you need single or multi-user capabilities, GIMIX has hardware and the operating systems to get the job done reliably.

Please phone or write if you need further information.

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CHRISTMAS SHOPPING LIST

F=Flex O=OS-9 R=Radio Shack

NEW	NOMAD The Personal Robot for CoCo complete with software.	250.00	

WORD PROCESSING

	DynaStar OR DynaForm	49.95	FO
	DynaStar AND DynaForm	99.90	FO
	DynaSpell, the best spelling checker	59.95	FO
	DynaSpell w/Lookup for RS OS-9	94.90	O
NEW	Dyna-Pak (DS/DF and Word-Pak)	199.95	FO
	Stylograph	99.95	FO
	Stylo-Pak (Stylo and Word-Pak)	199.95	FO
	TSC Text Processor for Flex	75.00	F

LANGUAGES

	TSC X-BASIC for Flex	100.00	F
	TSC Pascal for Flex	200.00	F
	Basic09 for RS OS-9	99.95	O
	C-Compiler for RS OS-9	99.95	O
	Crunch Cobol for Flex	100.00	F
	Windrush PL/9	198.00	F
	A/BASIC compiler	75.00	FO
	Dyna-C compiler	59.95	FO
	eFORTH (The best FORTH)	79.95	FR
	DynaSoft Pascal (P code compiler)	59.95	FO
	Introl C full compiler	425.00	F

SPREADSHEET and DATABASE

	Dynacalc for CC Flex	200.00	F
NEW	Dynacalc for RS Dos	99.95	R
	RMS Database for CC Flex	200.00	F
	RMS for Radio Shack OS-9	250.00	O
	InfoMag Database	99.95	F

SYSTEM SOFTWARE

SPEC	Color Computer Flex	49.95	F
SPEC	ED/ASM for Flex	49.95	F
SPEC	Flex with ED/ASM	69.95	F
	DBASIC with CC Flex	30.00	F
	Radio Shack OS-9	69.95	O
	O-Pak Hi-Res and copy for RS OS-9	34.95	O
	SDisk for RS OS-9	29.95	O
	SDisk w/BootFix for RS OS-9	35.95	O

UTILITIES and PROGRAMMING TOOLS

NEW	CModem Terminal program	50.00	FO
NEW	Color Connection II	49.95	FO
NEW	Color Connection II for RS DOS	39.95	R
	Color Utilities for CC Flex	50.00	F
	Disk Utility Program	50.00	F
	Super Sleuth disassembler	50.00	FO
	Super Sleuth for RS DOS	49.00	R
	Dynamite + for Flex	100.00	F
	Dynamite + for RS OS-9	59.95	O
	Toolkit #1 (for XBasic)	49.95	F
	TS Edit for Flex (same as RS OS9)	34.95	F
	Utilix for RS OS-9	49.95	O
NEW	UniCharger for RS OS-9	150.00	O
NEW	Textools for RS OS-9	29.95	O
	File Handler's Toolbox RS OS-9	85.00	O
	Filter Kit #1 for RS OS-9	29.95	O
NEW	Filter Kit #2 for RS OS-9	29.95	O
	Hacker's Kit #1 for RS OS-9	24.95	O

UTILITIES and PROGRAMMING TOOLS cont.

TSC Debug for Flex	75.00	F
TSC Diagnostics for Flex	75.00	F
TSC Extended Precompiler for Flex	50.00	F
TSC Flex Utilities for Flex	75.00	F
TSC Sort Merge for Flex	75.00	F
TSC 68000 Cross Assembler Flex	250.00	F
Windrush MACE editor/assembler	98.00	F
Esther (AI for Flex)	39.95	F
6502 Translator for Flex	75.00	F
6502 Translator for RS OS-9	85.00	O
MACROS for Flex	50.00	F
MACROS for RS OS-9	55.00	O
MACROS / ALL for Flex	100.00	F
MACROS / ALL for RS OS-9	110.00	O
PIC/PID for Flex	50.00	F
PIC/PID for RS OS-9	75.00	O
6805 Debugging Simulator / Flex	75.00	F
6805 Debugging Simulator/RS OS-9	100.00	O
6502 Debugging Simulator / Flex	75.00	F
6502 Debugging Simulator/RS OS-9	100.00	O

HARDWARE

	Video + for CoCo	24.95	
	Video + II M for CoCo	26.95	
	Video + II C for CoCo	39.95	
	PBJ Word-Pak (NEW low price)	119.95	
NEW	PBJ Word-Pak II (80X24 and smooth)	149.95	
	P-C Pak w/Printer Port & Clock	132.70	
	Y-Cable for WordPac	29.95	
NEW	OS-9 Driver for Word-PaK	19.95	O
	Flex Driver for Word-PaK	19.95	F
	OS-9 Driver for PC Pac	24.95	O
	8-64K Dynamic RAM Chips	45.00	
*	Drive 0, ½ Height SSDD 40T	353.00	
*	Drive 0, ½ Height DSDD 40T	374.00	
*	Drive 0, ½ Height DSDD 80T	391.00	
*	Drive 1, SSDD 40T ½ Hgt. Drive	223.00	
*	Drive 1, DSDD 40T ½ Hgt. Drive	244.00	
*	Drive 1, DSDD 80T ½ Hgt. Drive	261.00	
	Bare SSDD 40T ½ Height Drive	160.00	
	Bare DSDD 40T ½ Height Drive	195.00	
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*	½ Height Dual 5¼" CASE W/PS	79.95	
	J & M Disk Controller	139.95	
NEW	DSS Disk Controller JDos or RS DOS	139.95	
	HJL Keyboard for CoCo	79.95	

* case holds TWO ½ height drives

Books and other stuff

	Starter Kit for Compuserve	39.95	
	Basic09 Tour Guide Book	18.95	O
NEW	Relocating Macro Assembler Manual	25.00	O
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JDOS

JDOS implements all RS DOS basic commands, plus many more, including auto line numbering, up and down arrow keys for scrolling, DOS to boot OS/9*, FLEX*, and error trapping. JDOS supports RS compatible disk formats, plus handles 40 track single side and double side drives.

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Memory Minder is a disk drive test program that makes the following major checks of your drives without disassembly or special test equipment: head alignment, disk speed, index hole timing, azimuth, hysteresis, read sensitivity, and clamping. Memory Minder can be used to actually align the drives while viewing the graphics on the screen. This program is a must for anyone who values the data that is saved on diskettes.

MM-COCO-1 Memory Minder for single side drives	$79
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